NAVAL POSTGRADUATE SCHOOL
MONTEREY, CALIFORNIA

THESIS

OUTSOURCING VERSUS RETAINING IN-HOUSE CAPABILITY TO FULFILL NAVAL POSTGRADUATE SCHOOL'S FAMILY HOUSING MAINTENANCE REQUIREMENTS

by

Stewart H. Holmes

December, 1994

Principal Advisor: Joseph G. San Miguel

Approved for public release; distribution is unlimited.

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE December 1994	3. REPORT TYPE AND DATES COVERED Master's Thesis

4. TITLE AND SUBTITLE OUTSOURCING VERSUS RETAINING IN-HOUSE CAPABILITY TO FULFILL NAVAL POSTGRADUATE SCHOOL'S FAMILY HOUSING MAINTENANCE REQUIREMENTS	5. FUNDING NUMBERS
6. AUTHOR(S) Stewart H. Holmes	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey CA 93943-5000	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSORING/MONITORING AGENCY REPORT NUMBER
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.	
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.	12b. DISTRIBUTION CODE

13. ABSTRACT *(maximum 200 words)*

The objective of this research is to determine if it would be beneficial to retain the in-house capability to perform maintenance of the military family housing under the purview of the Naval Postgraduate School's (NPS) Family Housing Division. The alternative to this status quo would be to eliminate the in-house capability and outsource the required maintenance.

The significance of this question stems from the nearly tripling, as of October 1994, of the number of housing units under the purview of the NPS Family Housing Division. The resulting increase in maintenance responsibilities will significantly increase the resources managed and utilized by Housing.

To address this question a comparison of FY93 maintenance and costs between NPS and Naval installations at Point Mugu, CA; China Lake, CA; and Mare Island, CA, which outsourced their family housing maintenance, was made. This comparison included a comparison of costs in eleven maintenance categories and in total maintenance costs. Four possible causes of differences in costs were examined. These included differences in the number and size of units, local economic conditions, structural conditions of units, and change of occupancy rates.

This study concludes that outsourcing the military family housing maintenance requirements at NPS does not appear to be cost beneficial.

14. SUBJECT TERMS Naval Postgraduate School Family Housing Maintenance; Military Family Housing Maintenance; Outsourcing.	15. NUMBER OF PAGES 96
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	UL

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-18 298-102

Approved for public release; distribution is unlimited.

OUTSOURCING VERSUS RETAINING IN-HOUSE CAPABILITY TO FULFILL NAVAL POSTGRADUATE SCHOOL'S FAMILY HOUSING MAINTENANCE REQUIREMENTS

by

Stewart H. Holmes
Captain, United States Marine Corps
B.A., The Citadel, 1986

Submitted in partial fulfillment
of the requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
December 1994

Author: Stewart H. Holmes
Stewart H. Holmes

Approved by: Joseph G. San Miguel
Joseph G. San Miguel, Principal Advisor

Walter E. Owen, Associate Advisor

David R. Whipple, Jr., Chairman
Department of Systems Management

ABSTRACT

The objective of this research is to determine if it would be beneficial to retain the in-house capability to perform maintenance of the military family housing under the purview of the Naval Postgraduate School's (NPS) Family Housing Division. The alternative to this status quo would be to eliminate the in-house capability and outsource the required maintenance.

The significance of this question stems from the nearly tripling, as of October 1994, of the number of housing units under the purview of the NPS Family Housing Division. The resulting increase in maintenance responsibilities will significantly increase the resources managed and utilized by Housing.

To address this question a comparison of FY93 maintenance and costs between NPS and Naval installations at Point Mugu, CA; China Lake, CA; and Mare Island, CA, which outsourced their family housing maintenance, was made. This comparison included a comparison of costs in eleven maintenance categories and in total maintenance costs. Four possible causes of differences in costs were examined. These included differences in the number and size of units, local economic conditions, structural conditions of units, and change of occupancy rates.

This study concludes that outsourcing the military family housing maintenance requirements at NPS does not appear to be cost beneficial.

TABLE OF CONTENTS

I. INTRODUCTION

A. BACKGROUND

The origins of military family housing in the United States can be traced back to 1782 when the Army provided a four horse covered wagon to a Major General and his family. By the early 1800's, military family housing was beginning to be provided on post for the commanding officer and his family as well as some of his senior officers and their families [Ref. 1]. From that point on, the military services have been providing housing to military families or compensation for housing of military families to their members.

In 1991, the Congressional Budget Office (CBO) estimated that 30 percent of military families lived in Department of Defense (DoD) housing. This figure rose to 33 percent for 1993. This increase can be attributed to the reduction of military personnel on active duty, or downsizing, that the DoD has been undergoing over the past few years. While the number of military personnel has been decreasing, the inventory of DoD family living quarters (units), which consist of both single family and multi-family structures, has not undergone a similar decline. Based on this trend, CBO estimates that the percentage of military families that occupy DoD housing could reach 38 percent by 1999.

This increase in the percentage of military families that live in DoD housing, or stated another way, the lack of the number of military family housing units declining at a rate similar to that of military personnel, can probably be attributed to DoD's emphasis on quality of life for its personnel. Quality of life encompasses items which impact military members and their families. These items can range from health care, to housing, to the ratio of time spent

deployed away from family to the time spent stationed with family, and many other items.

In a period of downsizing, it can be expected that the Department of Defense would be sensitive to quality of life issues so that it could currently retain and recruit in the future the number of quality personnel that a smaller military force requires. Since a military family that relies on the private-sector for housing expends, on average, 20 percent more than a family that relies on DoD housing [Ref. 2], it can be expected that an increase in the percentage of military families that live in DoD housing would provide an increase in quality of life. Put another way, any decrease in the number of family housing units maintained by DoD would probably be perceived by military personnel as a decrease in their quality of life. As previously pointed out, it is logical for DoD not to want this perception fostered. A perception of this nature could negatively affect retention and future recruitment of military personnel.

Today, in the United States, the Department of Defense owns or leases more than 300,000 units; two-thirds of which were constructed between 1950 and 1966 [Ref. 3]. To maintain this inventory level along with an additional inventory of over 100,000 units outside of the United States, the government spends approximately $3.5 billion annually. The government estimates that it will continue to spend between $3.5 billion to $4.0 billion annually from 1994 to 1997 [Ref. 4].

The Department of the Navy's portion of the $3.5 billion family housing expense for Fiscal Year 1993 (FY93) was just over $1.0 billion [Ref. 5]. This $1.0 billion can be broken down into two broad categories. The first category is construction which accounts for about $0.4 billion. The second category totals approximately $0.6

billion, and it consists of operation, maintenance and debt payment [Ref. 6].

These two categories can be further broken down into subcategories. Construction includes the subcategories of construction of new housing, construction improvements, and planning which had budgets of approximately $233 million, $131 million, and $14 million respectively. Under the second category of operation, maintenance, and debt payment, operation consists of operating expenses, utilities, and leasing, which were estimated at $137 million, $205 million, and $104 million respectively. Maintenance accounted for approximately $228 million, and debt payment accounted for about $90 thousand [Ref. 7].

B. OBJECTIVE

The Department of Defense (DoD) budget has declined in terms of real spending for the past 10 years. This trend has forced the military services to look for more cost efficient ways of doing business in both combat and support activities.

As one of the Navy's premier learning institutions and support activities, the Naval Postgraduate School (NPS) is feeling the effects of the declining budget. With a declining budget projected for the foreseeable future, NPS is looking for more cost effective methods of conducting its mission.

In response to and in support of this effort, the Family Housing Division of the Department of Public Works at NPS is continually seeking methods to reduce the cost of operations. Of the expenses in the category of operation, maintenance, and debt payment; maintenance accounts for the single largest expense that the Navy military family housing authorities can influence. Thus, it is the logical candidate to be the first target for possible cost savings.

Since no two Naval installations are exactly the same, it is incumbent upon each installation to determine the most

cost effective method to maintain its military family housing.

Currently, there are two broad methods being used to accomplish maintenance of military housing. The first, and more traditional method, is for the installation to maintain the in-house capability of performing its own maintenance. Under this method, the Naval installation hires civil service workers with trade experience in areas such as plumbing, carpentry, electrical, and heating, air conditioning and ventilation as well as general laborers and maintenance workers. This method is often augmented by contracting some maintenance functions. Under this method, the determination of whether to perform the maintenance in-house or contract out is determined by two sections within the Department of Public Works which has cognizance of military family housing. The first section is the Housing Division, and the second section is the Maintenance Control Division. Their decision to rely on in-house personnel or to contract out a maintenance item is primarily influenced by considerations such as cost, expertise, special equipment, control over the work, and time requirements.

The second method used to maintain military family housing is for the installation to outsource or contract out all of the military family housing maintenance functions to a private company. Typically, for an installation to make use of this method, the installation would define the requirements, develop and mail Invitation for Bids, evaluate bids received from contractors, and award the contract. Once the contract is awarded, the installation must manage and monitor the contract.

The outsourcing process, as outlined above, identifies only the broad aspects of contracting out a function. This whole process involves many steps, and it is complex. It requires the interaction of many parties which are both internal and external to the installation. If an

installation has not previously contracted out its family housing maintenance, the processes involved from requirements definition to contact award could easily span ten months. While this process is complex and time consuming, as is managing the contract, the installation expects to realize savings through the use of this competitive process.

The objective of this research is to determine if it would be beneficial to retain the in-house capability to perform maintenance of the military family housing under the purview of the Naval Postgraduate School's Family Housing Division. The Naval Postgraduate School and its housing area, La Mesa Village, are located in Monterey, CA, approximately 115 miles south of San Francisco.

The determination of the most cost effective method of maintaining NPS's housing will have a greater significance for the future maintenance operations conducted by the Family Housing Division. In October 1994, the NPS Family Housing Division will assume responsibility for maintaining the U. S. Army's Defense Language Institute's family housing located at the Presidio of Monterey and at the Presidio of Monterey Annex (portions of old Fort Ord). This is due to the closure of Fort Ord, which was performing the management and maintenance of these units, which are located within approximately a 15 mile radius of NPS. This additional responsibility will almost triple the number of units to be maintained by the Naval Postgraduate School beginning on 1 October 1994. Thus, the determination of which method of maintaining military family housing is more cost effective should enhance the economical use of the NPS Family Housing Division's resources. A determination now, should result in significant savings over an indefinite period of time as the number of family housing units under the Family Housing Division's purview almost triples.

C. RESEARCH QUESTIONS

The primary research question to be examined in this study is; Is it cost beneficial to outsource the Naval Postgraduate School's military family housing maintenance requirements? To help determine the answer to this question, three secondary questions will be explored. First, what family housing maintenance functions lend themselves to outsourcing? Second, what are the current costs of performing maintenance functions in-house at the Naval Postgraduate School that could be contracted out? Finally, what would be the projected costs of outsourcing the identified maintenance?

D. SCOPE

The scope of this thesis is limited to identifying family housing maintenance at the NPS which lends itself to outsourcing and to the in-house and outsourcing costs associated with this maintenance. While this study may probe some of the non-monetary or non-quantifiable costs or benefits such as, scheduling flexibility, continuity, and the possible permanent loss of the ability to reconstitute the in-house capability to perform the required housing maintenance, it will not attempt to assign a dollar value to these factors or benefits.

E. METHODOLOGY

The primary methodology used to conduct this research will be a review and analysis of the Fiscal Year 1993 housing maintenance costs as recorded in the Naval Postgraduate School's family housing database and as recorded for three west coast Naval installations which contract out their family housing maintenance.

The three installations that were chosen for comparison with the Naval Postgraduate School are the Naval Air Weapons Station, Point Mugu, CA, which is located about 50 miles northwest of Los Angeles, CA; the Naval Air Weapons Station, China Lake, CA, which is located about 150 miles north of

Los Angeles, and the Naval Shipyard, Mare Island, CA, which is located about 25 miles north of San Francisco. These three installations were chosen because they maintain relatively the same number of housing units that the Naval Postgraduate School maintains.

In examining the data obtained, the bottom line or total cost of family housing maintenance will be compared among the installations. This will answer the question of which method of maintenance has resulted in the least expenditures on military family housing on the government's behalf. However, a more in-depth look at the data will be made in an attempt to explain the cost variation among the installations. This closer look will examine items such as labor costs across the trades and crafts, differences in maintenance requirements among the commands, and variances caused by differences in maintenance classifications.

In addition to comparing the costs as recorded by the NPS housing office to the costs of family housing maintenance at Point Mugu, China Lake, and Mare Island, this analysis will be augmented by archival research, by observations of maintenance work, and by interviews with Housing and Public Works officials and employees. By using these methods, the pertinent maintenance costs of military family housing for these organizations should be captured for comparison and analysis.

F. PREVIEW OF CHAPTERS

In addition to this introductory chapter, this study will be organized in four additional chapters. The second chapter will review the present (FY93) inventory of family housing that NPS maintains. It will also provide a review of the maintenance functions that are performed in-house and contracted out. The last item that Chapter II will examine is the in-house infrastructure used to support the maintenance requirements.

Chapter III will review the present (FY93) inventory of family housing that the Naval Air Weapons Station, Point Mugu, CA; the Naval Air Weapons Station, China Lake, CA; and the Naval Shipyard, Mare Island, CA, maintains. It will also review the family housing maintenance which is outsourced at Point Mugu, China Lake, and Mare Island. Finally, it will review the infrastructure used to support outsourcing at these installations.

Chapter IV will identify family housing maintenance which lends itself to outsourcing. It will also compare the in-house costs of maintenance associated with the NPS with the costs associated with outsourcing of the maintenance functions at Point Mugu, China Lake, and Mare Island.

The final chapter will provide conclusions drawn from the analysis in Chapter IV, state recommendations, and suggest areas of further research.

II. NAVAL POSTGRADUATE SCHOOL HOUSING

This chapter will provide a brief description of the Naval Postgraduate School's (NPS) mission and size. It will review the present FY93 inventory of military family housing that NPS maintains and the origins of this housing. It will also discuss the maintenance of military family housing in general which will lead to a detailed look at family housing maintenance which is funded and accomplished through the NPS Family Housing Division. Within this detailed look at family housing maintenance at NPS, the in-house infrastructure used to support the maintenance requirements along with the maintenance functions that are performed in-house and contracted out or outsourced at the Naval Postgraduate School will be presented.

A. BACKGROUND

The Naval Postgraduate School and its housing area, La Mesa Village, are located in Monterey, CA, approximately 115 miles south of San Francisco. NPS has occupied its present site since 1951. NPS provides specially tailored graduate programs that integrate academic disciplines with unique military applications. The primary mission of the Naval Postgraduate School is to provide masters level education to U.S. military officers and DoD civilians as well as to foreign military officers and defense personnel.

The Naval Postgraduate School's student population consist of approximately 1,800 officers and civilians. To carry out its mission, NPS employs approximately 350 permanent and temporary civilian faculty, 100 officers on faculty and staff, 100 enlisted personnel on staff, and 600 civilian employees. La Mesa Village provides family housing for NPS students and military officers which are part of the NPS staff and faculty. Enlisted personnel stationed at NPS who qualify for military family housing are billeted at Ft. Ord; approximately a ten minute drive from NPS.

B. HOUSING INVENTORY

In an effort to meet the military family housing needs of its students and military staff, the Naval Postgraduate School's Family Housing Division within the Department of Public Works, maintains 891 family living quarters (units), which consist of both single family and multi-family structures. These units are located in two separate areas. The first group of military family housing quarters are located on the main campus of NPS. There are 14 units in this group, and they are used to house the superintendent and his senior officers. The second group of military family housing quarters comprise the La Mesa Village and consists of 877 units situated on 300 acres and located approximately one and one-half miles from the Naval Postgraduate School. They are used to house students, and staff and faculty officers.

The 891 units that the Family Housing Division maintains can be divided into four categories of housing based on the method of procurement and date of construction (see Table 2.1). The first category consists of housing that was acquired incidental to land purchases. The superintendent's and his senior officers' quarters located on the main campus of NPS fall within this category.

The second category consists of units built under the Wherry program. Congress authorized this program in 1949 under Public Law 81-211, and it lasted until 1954; 83,000 units were built under this program [Ref. 8]. This program provided for privately financed construction of family housing units on government owned property which have since been acquired by the government. Of the quarters maintained by the NPS Family Housing Division, 449 units fall within this category.

CATEGORY	TYPE of QUARTERS	YEAR BUILT	QUANTITY OF UNITS
I	Flag Officer	1926	1
	Senior Officer	1928	13
II	Wherry	1952	449
III	Capehart	1962	150
IV	Townhouses	1965	160
	Townhouses	1969	118
	TOTAL:		891

Table 2.1 Naval Postgraduate School Family Housing Inventory

The next category of housing consists of units built under the Capehart program. Congress authorized this program in 1955 under Public Law 84-345, and it lasted until 1962; over 115,000 units were built under this program [Ref. 9]. This program provided for the building of military family housing units by private contractors on government owned land. Upon completion of construction, the government took over the operation, maintenance, and mortgage of the units. Of the quarters maintained by the NPS Family Housing Division, 150 units fall within this category.

The fourth and final category of housing that will be mentioned consists of units built or acquired under direct funding appropriated by Congress between fiscal years 1950 - 1969 [Ref. 10]. Of the quarters maintained by the NPS Family Housing Division, 278 units fall within this category. La Mesa Village is comprised of military family housing quarters which fall within the categories that have been labeled two through four in this discussion.

As a result of the government's many military family housing construction initiatives, of which the four mentioned above are part, DoD military family housing in the United States has grown from the four horse covered wagon

provided to an Army Major General and his family in 1782 to the more than 300,000 units today. Each requires decisions as to maintenance.

C. MAINTENANCE

1. Background

To maintain the inventory of the Department of Defense's 300,000 units of military family housing located in the United States along with the additional inventory of over 100,000 units outside of the United States, the government spent approximately $3.5 billion in fiscal year 1993. The Department of the Navy's portion of the $3.5 billion family housing expense for FY93 was just over $1.0 billion. This $1.0 billion can be broken down into two broad categories. The first category is construction which accounts for about $0.4 billion. The second category totals approximately $0.6 billion, and it consists of operation, maintenance and debt payment.

These two categories can be further broken down into subcategories. The first category, construction, includes the subcategories of construction of new housing, construction improvements, and planning which had budgets of approximately $233 million, $131 million, and $14 million respectively. The subcategory of construction of new housing entails what the subcategory title sounds like; it consist of the building of new facilities. The subcategory of construction improvements contains items such as the modernization of or addition to an existing facility. The third subcategory, planning, also entails what it sounds like--the planning and design for new construction and improvements.

Under the second category of operation, maintenance, and debt payment, operation consists of operating expenses, utilities, and leasing, which were estimated at $137 million, $205 million, and $104 million respectively.

Maintenance accounted for approximately $228 million, and debt payment accounted for about $90 thousand.

Operation, in the second category of operation, maintenance, and debt payment, contains operating expenses which include items such as refuse collection, pest control, municipal type (police and fire) and other services. It also includes items such as management of the family housing office; indirect administrative support; procurement of furniture and equipment that is not structurally part of a unit; and the moving, maintenance, and repair of the procured furniture and equipment. Operation also contains utilities which include such items as gas, electricity, water, and sewage. The last segment of operation is leasing, and it consists primarily of housing leased from the private sector. [Ref. 11]

Under the second category of operation, maintenance, and debt payment; maintenance can be broken down into three subcategories--maintenance, major repair, and quarters cleaning. The subcategory of maintenance includes items such as responding to service calls (an occupant's call for repair or service of a unit), routine maintenance, painting, and maintenance of grounds and surface areas.

The subcategory of major repair consists of items such as the restoration of a unit or facility which costs more than the local commander can authorize, $15,000 or 50 percent of the replacement cost of the item being repaired. Funds for major repairs do not fall within the family housing budget of local field activities or commands such as NPS. These types of repairs are funded by Engineering Field Divisions which represent the next higher echelon in the Naval Family Housing organization. The final subcategory, quarters cleaning, consists primarily of cleaning quarters which were not cleaned by the previous occupant. Use of this subcategory is minimal. [Ref. 12]

Currently, there are two broad methods being used by DoD and the Navy to accomplish what has been labeled as the subcategory of maintenance (i.e., service calls, routine maintenance, painting, and maintenance of grounds and surface areas) under the second category of operation, maintenance, and debt payment. The first, and more traditional method, is for the installation to maintain the in-house capability of performing its own maintenance. Under this method, the Naval installation hires civil service workers with trade experience in areas such as plumbing, carpentry, electrical, and heating, air conditioning and ventilation as well as general laborers and maintenance workers.

This method is often augmented by contracting some maintenance functions. The determination of whether to perform the maintenance in-house or contract out is determined by two sections within the Department of Public Works which has cognizance of military family housing. The first section is the Housing Division, and the second section is the Maintenance Control Division. Their decision to rely on in-house personnel or to contract out a maintenance item is primarily influenced by considerations such as cost, expertise, special equipment, control over the work, and time requirements.

The second method used to maintain military family housing is for the installation to outsource or contract out all of the military family housing maintenance functions to a private company. Under this method of performing maintenance, the Family Housing Division retains no in-house maintenance workers, however, it does retain government employees to manage and to provide oversight of the operations of the military family housing.

2. Maintenance

Currently, the Naval Postgraduate School's Family Housing Division uses the first method to perform

maintenance of its facilities. They maintain the in-house capability of performing maintenance as well as contracting or outsourcing some maintenance functions. The NPS Family Housing Division as well as the in-house or on station maintenance personnel dedicated to the support of family housing fall within the Department of Public Works at NPS. In the Family Housing Division, under the Housing Director/Manager, is the Facilities Branch Manager. He is responsible for the up-keep of all of the Housing Division's facilities to include housing units and grounds. The on station maintenance personnel are assigned to the Housing Maintenance Section of the Housing, Emergency Service, and Specific Maintenance Branch within the Department of Public Works, and they are led by the Housing Maintenance Supervisor (see Table 2.2).

The family housing maintenance personnel consist of civil service workers with experience in the trades of plumbing, carpentry, and electrical, as well as maintenance mechanics, supervisors, production controllers, and general laborers and maintenance workers. The maintenance staff consist of 20 personnel plus the supervisor, and they range in paygrades from WG-03 (approximately $9 per hour) to WS-11 (approximately $20 per hour), see Table 2.3.

The determination of whether to perform the maintenance in-house or contract out is determined by both the Family Housing Division and the Maintenance Control Division. If the Family Housing Division has a preference as to contract out or use in-house personnel to accomplish a specific function, they will relay that preference to the Maintenance Control Division. However, the Maintenance Control Division will make a final determination. Their decision to rely on in-house personnel or to contract out a maintenance item is primarily influenced by considerations such as expertise, special equipment, control over the work, time requirements, and cost.

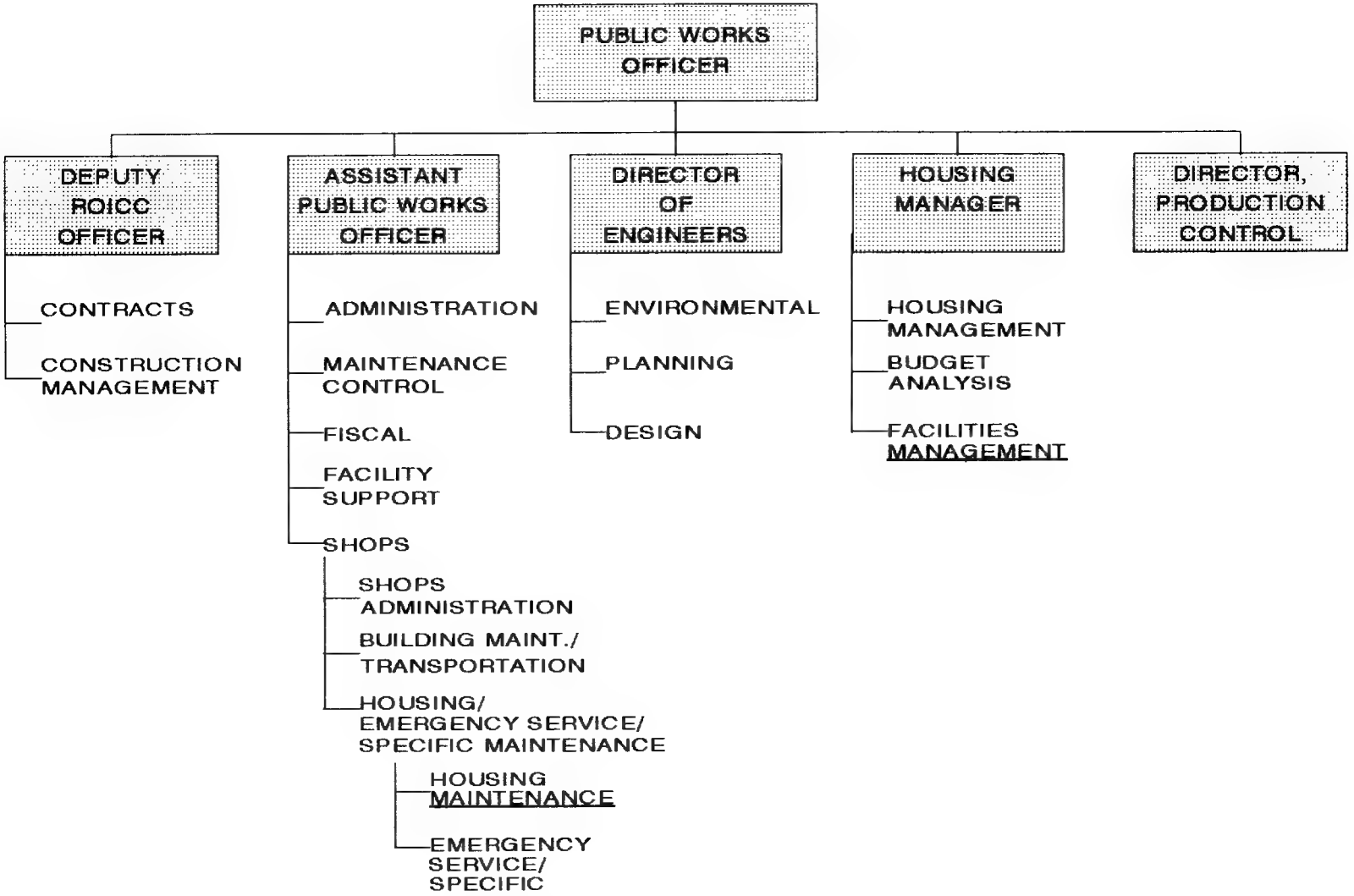

Table 2.2 NPS Department of Public Works Organizational Chart

POSITION	NUMBER OF PERSONNEL	PAYGRADE
Housing Maintenance Supervisor	1	WS - 11
Maintenance Leader	1	WL - 10
Maintenance Electrician	1	WG - 10
Maintenance Mechanic	3	WG - 09
Carpenter	2	WG - 09
Plumber	2	WG - 09
Maintenance Worker	4	WG - 08
Toolroom Mechanic	1	WG - 08
Material Handler	1	WG - 06
Production Controller	1	GS - 06
General Helper	1	WG - 05
Laborer	3	WG - 03
Total:	21	

Table 2.3 Family Housing Maintenance Positions

A repair involving asbestos could be an example of a situation where special equipment and expertise are a consideration in determining whether to contract out or rely on in-house personnel to perform the repair. If a maintenance requirement involved working in an area where asbestos would be disturbed and personnel on the in-house staff were not licensed to remove asbestos or if they did not have the proper equipment to handle asbestos removal then the maintenance item would have to be contracted out. Another example would be if repair to the roof of one of the units which was covered with ceramic tile instead of the more common asphalt shingles was needed. If in-house craftsmen did not possess the expertise to perform the repair, then a tile roof craftsman would be contracted to perform the repair.

There are also many instances when a maintenance item requires more man-hours than housing officials or the maintenance supervisor likes to commit the time of the in-house maintenance personnel. If in-house personnel were committed to many of these types of maintenance requirements, they might not be able to respond to service calls or emergencies requiring immediate attention. However, there are occasions when a maintenance item requiring numerous man-hours has such a high command interest that it is prudent to assign on-station personnel to perform the maintenance. The Family Housing Division has more influence over how and when work is accomplished by in-house personnel than over work that is outsourced.

The NPS Family Housing Division and the Maintenance Control Division review all the considerations mentioned above when they project the cost of a maintenance requirement or job in their process of determining whether the job should be performed by their in-house maintenance staff or contracted out to a private firm.

a. In-House Maintenance at NPS

Maintenance performed by NPS in-house maintenance personnel in FY93 varied. It predominately included maintenance that required less than 16 man-hours, maintenance performed as a result of a change of occupancy, and standing (recurring scheduled annually or seasonally) maintenance functions.

Maintenance that required less than 16 man-hours was generally generated as a result of service calls and complaints from occupants and maintenance requirements identified as part of the on-going maintenance and repair inspection program which requires that a minimum sampling of 25 percent of the facilities that the Family Housing Division maintains be inspected annually [Ref. 13]. Service calls can include the request for maintenance or service on almost any item, interior or exterior to a family housing

unit. This type of maintenance ranges from replacing light switches, to repairing an inoperable toilet, to unclogging a drain, to fixing or replacing hot water heaters and furnaces, to repairing sections of roofing. The types of maintenance encompassed by service calls are virtually limited only by the imagination of the military family housing occupants.

Maintenance requirements performed by the in-house maintenance personnel which were generated by the maintenance and repair inspection program include the same type of maintenance items as initiated by service calls.

Maintenance performed by on-station personnel as a result of the change of occupancies of units is as varied as the maintenance generated as a result of service calls or complaints by occupants. However, in this situation, maintenance requirements are identified by a series of inspections which involve the out-going and in-coming occupants as well as housing officials. This battery of inspections consist of pretermination, termination, make-ready, and check-in inspections.

In the pretermination inspection, the out-going occupant and a housing official inspect the unit. The emphasis of this inspection is on the housing official reiterating the occupants responsibilities prior to the occupant vacating quarters and for the housing official to record and schedule maintenance required prior to a new occupant taking control of the unit. [Ref. 14]

In the termination inspection, the out-going occupant and a housing official inspect the unit. The emphasis of this inspection is on ensuring that the occupant has fulfilled his or her responsibilities and to relieve the occupant of his or her responsibility for the unit [Ref. 15]. If the occupant vacates the unit without fulfilling his or her responsibilities (i.e., damages not corrected) then the occupant will be charged for repairs.

Required maintenance resulting from this situation would be recorded and scheduled by the housing official during this inspection.

The next inspection, the make-ready inspection, is performed by a housing official. Its primary purpose is to ensure that the unit is clean and ready for assignment [Ref. 16].

The final inspection in this series of inspections is the check-in inspection. It is performed by the in-coming occupant and a housing official. The emphasis of this inspection is to accomplish a joint review of the condition of the unit. During this inspection, the new occupant is informed of his or her responsibilities, and the housing official makes himself or herself available to answer the occupant's questions. [Ref. 17]

The final primary source of maintenance requirements which was performed by NPS in-house maintenance personnel in FY93 originated from standing maintenance items. Standing maintenance is maintenance requirements that recur annually or seasonally; there are no man-hour limitations to this type of maintenance. It included the routine maintenance of the fire escapes attached to the townhouses built in 1965. Also included in standing maintenance work was the semiannual cleaning of the six and eight inch sewer lines in La Mesa Village. The semiannual inspection and filter change of the forced air type furnaces was also part of standing maintenance requirements. Other standing maintenance requirements encompassed the quarterly inspection and resulting repairs of the hydronic heating systems (water-based radiant heat), the quarterly inspection and maintenance of the water storage facility, and the cleaning of roof and gutters selected senior officer quarters. Finally, included as part of standing maintenance was the semiannual inspection and cleaning of the storm drains in La Mesa Village.

b. Outsourced Maintenance at NPS

Maintenance that was contracted out by NPS in FY93 also varied. It predominately included maintenance that required more than 16 man-hours, standing maintenance functions, and maintenance that required assets that were not possessed by the on station housing maintenance organization.

Maintenance that required more than 16 man-hours was generally generated in the same fashion as maintenance which required less than 16 man-hours. It was generated by service calls and complaints from occupants and maintenance requirements identified as part of the on-going maintenance and repair inspection program. Contracted maintenance also resulted from the examination of facilities maintenance records. An example of this type of maintenance would include the interior and exterior painting of military family housing units. The interior painting of a unit is usually accomplished every three years while the exterior painting of a unit normally occurs every four years.

The types of maintenance that were contracted out by NPS included the minor repair and replacement of structural components and equipment which required less than 80 man-hours per unit, interior painting, and grounds maintenance. Maintenance performed under the category of minor repair and replacement included items such as the repairing of roofs of senior officers' quarters and quarters located in La Mesa Village. It also included the refinishing of floors and the replacement of counter tops in the senior officers' quarters, and the refinishing of bathtubs.

Maintenance contracted out under the category of grounds maintenance included items such as the mowing, trimming, and caring of grass and the trimming, caring, and removal of trees. It also included the maintenance of surface areas such as repairing sidewalks and parking areas.

Interior painting maintenance consisted of preparing and painting the interior of family housing units.

D. SUMMARY

In this chapter we have seen that the Naval Postgraduate School maintains 891 housing units to support students and military officers which are part of the NPS staff and faculty. We have also seen that the NPS Family Housing Division is responsible for the maintenance of these units. In order to up-keep the military family housing units under their purview, the Family Housing Division maintains the in-house capability of performing maintenance as well as outsourcing some maintenance functions. The maintenance which is funded and accomplished through the NPS Family Housing Division includes maintenance items such as responding to service calls, routine maintenance, painting, maintenance of grounds and surface areas, and the cleaning of quarters which were not cleaned by the previous occupant.

We have also discussed other characteristics of the NPS family housing operation which included the employment of 21 civil service workers within the Housing Maintenance Section of the Housing, Emergency Service, and Specific Maintenance Branch of the Department of Public Works. The work performed by the on station housing maintenance force predominately consisted of maintenance which required less than 16 man-hours, maintenance performed as a result of a change of occupancy, and standing maintenance functions. On the other hand, maintenance contracted out predominately consisted of maintenance functions which required more than 16 man-hours, standing maintenance functions, and maintenance that required assets that were not possessed by the on station housing maintenance organization.

The next chapter will review the FY93 inventory of family housing that was maintained by three west coast Naval installations. It will also review maintenance which was funded and accomplished through the family housing offices

of these three installations. Maintenance at these installations was completely outsourced. Finally, Chapter III will review the infrastructure used to support outsourcing at these installations.

III. POINT MUGU, CHINA LAKE, AND MARE ISLAND HOUSING

This chapter will be divided into five main sections. The first section will consist of a general discussion of the outsourcing of commercial activities which should provide the basis for a better understanding of outsourcing and how it impacts military family housing maintenance. The next three sections will address, individually, the Naval installations of the Naval Air Weapons Station, Point Mugu, CA; the Naval Air Weapons Station, China Lake, CA; and the Naval Shipyard, Mare Island, CA, respectively. Each of these installations outsource all of their housing maintenance. Within each section, a brief description of the mission and size of each of the Naval installation being reviewed will be made. Each section will also review the FY93 inventory of family housing that was maintained by the installation, the maintenance which was funded and accomplished through the family housing office, and the infrastructure used to support outsourcing at the particular installation under review. The last section of this chapter will be a chapter summary.

A. OUTSOURCING COMMERCIAL ACTIVITIES

1. Background

To gain a better appreciation of what is meant by the phrase "outsourcing commercial activities," it is helpful to split the phrase into two parts and to define or describe what is meant by the individual parts of the phrase. The first part of the phrase is "outsourcing," and it represents another name for the action of contracting for the procurement of an item. This item could be a product or a service. The second part of the phrase, "commercial activities," refers to products or services that the U.S. government provides which could be obtained from a non-government source. Examples of commercial activities include items such as photography, automatic data

processing, operation of mess halls, maintenance of structures and equipment, fire protection and prevention, vehicle operation and maintenance, and the fabrication of machined products. The list is almost endless. So, when the two parts of the phrase of "outsourcing commercial activities" are put back together, the result is the contracting of a commercial firm for a product or service for the U.S. government's use.

One of the basic guiding principals of the government is the use of competition and free enterprise to maintain a strong and prosperous economy and country. Another basic principal of the United States is that the government should not be in competition with the people whom it has been created to serve. These principals were promulgated during the Eisenhower Administration in the form of the Bureau of the Budget Bulletin 55-4, and they have been reinforced by the Office of Management and Budget (OMB), Circular Number A-76 which was issued in 1966 and revised in 1967, 1979, and 1983 [Ref. 18].

In effect, Circular No. A-76 requires that commercial type work done by the federal government be studied to determine whether it is more economical for a commercial entity to perform the work. The primary restriction in determining the type of function that can be outsourced is that a function which is "...intimately related to the public interest as to mandate performance by Government employees..." cannot be outsourced; functions of this type are usually related to the act of governing or to monetary transactions and entitlements (i.e., tax collection) [Ref. 19]. Another restriction, which applies to the Department of Defense only, is the determination if a function should be performed by government workers for national defense purposes.

2. Considerations

Before a commercial activity is outsourced, an analysis should be made to determine if the performance of the function is more economical when accomplished by the government or a commercial firm. To perform this type of analysis, a task group of individuals should be formed. Members of the task group should include personnel with experience in the function under review, along with personnel experienced with contracting, writing performance statements, job classifications, finance, legal as well as other specialties.

Once the group has been formed, the function being considered for outsourcing needs to be rigorously defined along with a detailed description of the responsibilities and duties required of the personnel whose output will result in the accomplishment of the function. Upon the accomplishment of these tasks, the task group should next determine if the function is being performed in the most efficient manner by in-house personnel. Once this has been accomplished and performance standards, which provide a means to measure output, have been developed, then an estimate of the in-house costs to perform the function in the most efficient manner along with solicitations for bids by commercial firms can be made.

The cost estimate to perform the function in-house should include all costs that are incurred to perform the function along with costs that will arise as a the result of government workers being let-go if the function is contracted out. Examples of these costs include direct labor, direct and indirect overhead, material costs, and costs incurred when government personnel are terminated from a position (i.e., severance pay, relocation expenses, etc.).

When considering bids made by commercial firms to perform the function, the bid amount must be considered along with costs associated with the contracting out of a

function. Examples of these costs include the costs of contract specialists, quality assurance evaluators, and others which are required for the management, execution, and monitoring of the contract.

When computing the in-house cost of performing a function and the cost of outsourcing the function, it is prudent to consider all costs which are incurred as a result of maintenance activity. However, when comparing the in-house costs with the outsourcing costs to determine the most economical method of performing the function, it is only necessary to compare incremental costs. These are costs which are unique to each method of performance. For example, there is no need to consider the indirect overhead cost of the comptroller's support if it will require the same number and type of comptroller personnel to support both the in-house and the outsourcing accomplishment of a function.

B. NAVAL AIR WEAPONS STATION, POINT MUGU, CA

1. Background

The Naval Air Weapons Station, Point Mugu, CA, is located about 50 miles northwest of Los Angeles, CA, near the cities of Camarillo and Oxnard. The Navy has occupied this site since the mid 1940's under several station names. In January 1992, the name was changed from Naval Air Station Point Mugu to its present name of Naval Air Weapons Station (NAWS), Point Mugu. The Naval Air Weapons Station's mission is to operate and maintain facilities aboard the station and to provide support for the Naval Air Warfare Center Weapons Division (NAWCWPNS) and other tenant organizations. NAWCWPNS mission primarily consists of research and development, test and evaluation, and in-service engineering for weapons systems and subsystems which are related to air warfare.

To carry out these missions as well as the missions of the other tenant commands aboard Point Mugu, the government

relies on three principal types of employees--active duty military, civil servants, and contractor employees. This workforce consists of approximately, 2,700 military personnel, 3,800 civil servants, and 3,000 contractor employees.

2. Housing Inventory

In an effort to meet the family housing needs of the military personnel assigned to Point Mugu, its Family Housing Division, which is located within the Department of Public Works, maintains 883 family housing units. These units consist of both single family and multi-family structures which are located in two geographic locations. The first location is on Point Mugu, and it is comprised of Capehart Housing I and Capehart Housing II housing areas. These two housing areas are adjacent to each other. The combined total of housing units for these two areas is 568 units. The second location of military family housing is located in the city of Camarillo, which is approximately eight miles from Point Mugu. The Camarillo Naval Family Housing area is designated as Capehart III, and it consists of 315 units.

The 883 units that the Family Housing Division maintains can be divided into four distinct groups based on the method of procurement and date of construction (see Table 3.1). The majority of units, 867 family quarters, maintained by Point Mugu's Family Housing Division were funded under the Capehart program which was initiated in 1955 and lasted until 1962. These units built under the Capehart program can be further divided based on the year in which they were built. The 360 units built in 1958 have been designated as Capehart I. The 192 units built in 1962 have been designated as Capehart II, and the 315 units built in 1959 have been designated as Capehart III. The other 16 units were constructed in 1949, and they were funded with regular appropriated funding. These 16 units are located

within the Capehart I housing area, and they have been designated as Quarters A & B.

TYPE of QUARTERS	YEAR BUILT	QUANTITY OF UNITS
A & B	1949	16
Capehart I	1958	360
Capehart III	1959	315
Capehart II	1962	192
TOTAL:		883

Table 3.1 Point Mugu Military Family Housing Inventory

3. Maintenance

The housing maintenance required at Point Mugu is similar to the housing maintenance required at the Naval Postgraduate School. One would expect the maintenance to be similar, since both installations conduct operations based on the same basic guidelines which are promulgated by the Office of the Secretary of Defense and the Department of Navy.

The maintenance which was funded and accomplished through the Naval Air Weapons Station Family Housing Division included maintenance items such as responding to service calls, routine maintenance, painting, maintenance of grounds and surface areas, and the cleaning of quarters. As in the case of NPS, it did not include major repair or renovations.

To accomplish the maintenance requirements of the family housing under NAWS purview, family housing maintenance was contracted out. Fiscal Year 1993 was the second year that housing maintenance had been performed under this contract. The contract required that the contractor provide all of the labor, materials,

transportation, equipment, tools, supervision, and management necessary to perform the required maintenance. This included carrying out the facility inspection program and performing preventive and standing maintenance.

The contract was divided into two categories for reimbursement purposes. The first category or type of contract is the fixed price portion of the agreement. This type of contract is normally used when reasonably definite performance specifications can be developed, and the quantity, timing, and quality of work can be reasonably estimated based on historical data. Items in this part of the contract were specified or limited in scope, dollar amount, or quantity. Based on the requirements of this portion of the contract, the contractor agrees to perform the maintenance for a lump-sum price which is not subject to change unless the conditions or requirements of the contract are changed by the government.

Examples of maintenance performed by the contractor under the fixed price portion of the contract included change of occupancy inspections and maintenance, the maintenance and repair inspection program and resulting maintenance, responding to service calls, the annual inspection and adjustment of gas furnaces, the annual cleaning of roofs and gutters, and limited roof repair. It also included maintenance of appliances such as garbage disposal, furnaces, and water heaters.

The second category or type of contract used for family housing maintenance is the indefinite quantity portion of the agreement. This type of contract is normally used when work is going to be needed sometime during the life of the contract, but the exact timing or quantity of the work is not known. The contract contains a description of the work to be performed along with the minimum and maximum amount of work that can be performed under the contract. Based on the requirements and range of service outlined in the contract,

the contractor provides a fixed unit price schedule which defines his bid for the contract.

The fixed price portion of the Point Mugu contract constituted the minimum amount of services that would be procured under the indefinite quantity portion of the contract. In effect, the indefinite quantity portion of NAWS family housing maintenance contract provided for the performance of the same type of work that the fixed price portion of the contract required. It simply acted as a safety net for the personnel who estimated the military family housing maintenance requirements.

4. Infrastructure

The contracting out of family housing maintenance requires the involvement of many organizations, however, there are three primary participants. These primary participants are the Officer in Charge of Construction (OICC), which is located in the Public Works Department; the Housing Division, in the Public Works Department; and the contractor chosen to perform the maintenance. The Officer in Charge of Construction usually appoints a Contracting Officer or Specialist and a Service Contract Manager (SCM) from within his organization. Their primary function is to insure proper contact administration.

The SCM is usually assigned from the Facility Support Division of the Public Works Department and is responsible for the day-to-day management of the contract. He is also the Navy's point of contact to the contractor. To insure that the contractor is performing the required functions, the SCM develops a Quality Assurance (QA) plan to monitor the contractor. To carry out this program at Point Mugu, one person from the Facility Support Division was assigned as Quality Assurance Evaluator (QAE). The QAE possesses the technical knowledge necessary to properly inspect and evaluate the work accomplished by the contractor. It is important to note that the QAE does not administer the

contract; however, she is the primary device through which the SCM collects his information to administer the contract.

The Point Mugu Family Housing Division participates in this arrangement by initially identifying the scope of the work that needs to be accomplished along with performing their normal operation functions. These functions include items such as management of the Family Housing Division, indirect administrative support, and procurement of furniture and equipment that is not structurally part of a unit. Finally, the contractor's contribution to this agreement is the maintenance it performs. This relieves the requirement for maintaining in-house family housing maintenance personnel.

C. NAVAL AIR WEAPONS STATION, CHINA LAKE, CA

1. Background

The Naval Air Weapons Station, China Lake, CA, is located approximately 150 miles north of Los Angeles in the Mojave Desert--a remote area. The Navy has occupied the site since 1943 when it formed the Naval Ordnance Test Station. Since its establishment, the Navy has changed the name of the installation a couple of times which has resulted in its present name of the Naval Air Weapons Station, China Lake.

The Naval Air Weapons Station's mission is to operate and maintain facilities aboard the station and to provide support for the Naval Air Warfare Center Weapons Division (NAWCWPNS) and the other 23 tenant organizations at China Lake. NAWCWPNS mission is comprised of many aspects; a representative sample of its missions consists of research, design, development, test and evaluation, and in-service engineering support for weapons systems and subsystems which are related to air warfare and to tactical missiles. It also operates, maintains, and modifies the Naval Western Test Range Complex, along with providing support to the Navy's nuclear weapons program.

To carry out these missions as well as the missions of the other tenant commands located at China Lake, the Navy relies on both military personnel and civil servants. This workforce consists of approximately 700 military personnel and 5,000 civilians.

2. Housing Inventory

In an effort to meet the housing needs of the military personnel and some of the civilian personnel (twenty-five) assigned to China Lake, its Housing Division, which is located within the Department of Public Works, maintained 941 housing units in FY93. However, of the 941 housing units located at China Lake, 129 of these units were inactive (not used). Maintenance for inactive units is minimal.

Housing facilities at China Lake consisted of both single unit and multi-unit structures. Since the Naval Air Weapons Station, China Lake is such a remote and unique Naval installation (very small number of military personnel and relatively large civilian staff), the Housing Division was tasked with maintaining both family housing and bachelor quarters. Of the 812 active units, 690 were family housing units and 122 were bachelor quarters. It must be noted that, with the exception of 14 of these 122 bachelor quarters, the bachelor quarters at China Lake are comparable in size to the family housing units at the Naval Postgraduate School.

While the names assigned to the many types of housing units at China Lake are quite varied, the 941 housing units that are located on the Naval Air Weapons Station can be divided into groups based on the method of procurement or the date constructed (see Table 3.2). The majority of quarters, 500 units, maintained by China Lake's Housing Division were funded under the Capehart program and were built in 1962. The remaining 441 units were funded with

regular appropriated funding, and they were constructed between 1945 - 1950.

3. Maintenance

The housing maintenance at NAWS, China Lake is quite similar to the maintenance of housing units at NPS and Point Mugu. The maintenance which was funded and accomplished through the Naval Air Weapons Station Housing Division included maintenance items such as responding to service calls, routine maintenance, painting, maintenance of grounds and surface areas, and the cleaning of quarters. As in the case of NPS and Point Mugu, it did not include major repair or renovations.

To accomplish the maintenance requirements of the housing located at NAWS, housing maintenance was contracted out. Fiscal Year 1993 was the first year that housing maintenance had been performed under this contract. The contract required that the contractor provide all of the labor, transportation, tools, supervision, and management necessary to perform the required maintenance. This included carrying out the facility inspection program and performing preventive and standing maintenance.

This contract was similar to the Point Mugu contract. It was divided into two categories for reimbursement purposes. The first category or type of contract was the fixed price portion of the agreement. Items in this part of the contract were specified or limited in scope, dollar amount, or quantity. Based on the requirements of this portion of the contract, the contractor agreed to perform the maintenance for a lump-sum price.

Examples of maintenance performed by the contractor under the fixed price portion of the contract included change of occupancy inspections, the maintenance and repair inspection program, responding to service calls, the semiannual inspection and adjustment of gas furnaces and air conditioning units, the annual cleaning of roofs and

CATEGORY	TYPE of QUARTERS	YEAR BUILT	QUANTITY OF UNITS	
Active				
Family Housing	Commanding Officer's	1945	1	
	Senior Officer	1945	19	
	Senior Staff	1945	3	
	Junior Officer	1945	53	
	Duplex	1945	3	
	Senior Staff	1947	3	
	Married Officer	1950	12	
	Hill Duplex	1950	96	
	Capehart	1962	500	
	Subtotal:		690	
Bachelor Housing	Duplex	1945	33	
	Hill Duplex	1950	13	
	Apartment	1950	76	
	Subtotal:		122	
	TOTAL ACTIVE:			**812**
Inactive				
Family Housing	Junior Officer	1945	2	
	Duplex	1945	2	
	Hill Duplex	1950	5	
	Old Apartment	1950	4	
Bachelor Housing	Duplex	1945	104	
	Old Apartment	1950	12	
	TOTAL INACTIVE:			**129**
	TOTAL ACTIVE AND INACTIVE:			**941**

Table 3.2 China Lake Housing Inventory

gutters, limited roof repair and grounds maintenance. It also included maintenance of appliances such as garbage disposal, furnaces, and water heaters. Work that required more than 16 man-hours or an individual part costing more than $500 to fix would not be covered under this part of the contract, but it would be covered under the second part or category of the contract.

The second category or type of contract used for housing maintenance was the indefinite quantity portion of the agreement. The contract contained a description of the work to be performed along with the minimum and maximum amount of work that could be performed, but the exact timing or quantity of the work was not known. Based on the requirements and range of service outlined in the contract, the contractor provided a fixed unit price schedule which defined his bid for the contract.

Examples of maintenance performed by the contractor under the indefinite quantity portion of the contract included maintenance resulting from change of occupancy inspections, maintenance resulting from the maintenance and repair inspection program, and maintenance resulting from service calls which required more than 16 man-hours or an individual part costing more than $500 to fix.

4. Infrastructure

The infrastructure used to support this contract was similar to the infrastructure used to support the housing maintenance contract at Point Mugu. The OICC assigned a Contract Specialist, a Facilities Contact Manager, and two QAEs to carry out and enforce the contract. The Housing Division provided inspectors to assist in monitoring the performance of the contract, and it retained and performed its operation functions such as management of the family housing office, indirect administrative support, and procurement of furniture and equipment.

D. MARE ISLAND NAVAL SHIPYARD, VALLEJO, CA

1. Background

The Mare Island Naval Shipyard is located approximately 25 miles north of San Francisco, CA. The government purchased this site in 1852, and the Navy established its presence in 1854. The Mare Island Naval Shipyard has been serving the Navy's shipbuilding and repair needs ever since. Today, the mission of the Mare Island Naval Shipyard is to modernize, refuel, and overhaul submarines. However, as a result of the reduction in Defense funding and the activity of the Base Realignment and Closure Committee, this mission and the majority of the Naval operations at the Mare Island Naval Shipyard will be terminated as of April 1996.

To carry out the mission of the Shipyard as well as the mission of the 37 other tenant organizations located at Mare Island, the government utilizes military and civilian personnel. This workforce consist of approximately 2,070 military and 7,700 civilian workers.

2. Housing Inventory

In an effort to meet the family housing needs of the military personnel assigned to Mare Island, its Housing Department maintains 948 family housing units. These units consist of both single family and multi-family structures which are located in three geographic locations--Mare Island; Roosevelt Terrace, Vallejo; and Skaggs Island, Sonoma. Roosevelt Terrace is located approximately one mile from Mare Island and Skaggs Island is located approximately ten miles from Mare Island.

The 948 units that the Housing Department maintains were built over the Navy's long and distinguished presence at Mare Island. Because of this long presence and a housing construction period which spanned from 1863 - 1966, it is difficult to attribute the family housing to a specific military family housing funding program such as the Capehart or Wherry programs. However, military family housing at

Mare Island can be divided into fifteen groups based on the type or grade of occupant and the date of construction (see Table 3.3).

Family housing units maintained by Mare Island are designated for occupancy based on the military member's grade or rank. Four categories of family housing result. These categories are senior officer quarters, field grade officer quarters, junior officer quarters, and enlisted quarters.

TYPE of QUARTERS	YEAR BUILT*	QUANTITY OF UNITS
Senior Officer	1871-1938	18
Field Grade Officer	1863-1900	34
Enlisted	1941	398
Field Grade Officer	1942	1
Junior Officer	1942	15
Enlisted Duplex	1942	26
Junior Officer	1945	2
Enlisted	1949	3
Senior Officer	1953	1
Junior Officer Duplex	1956	10
Enlisted	1956	40
Enlisted Duplex	1964	88
Junior Officer Duplex	1965	46
Enlisted Duplex	1965	166
Enlisted Townhouse	1966	100
TOTAL:		**948**

(*Year built is approximate.)

Table 3.3 Mare Island Naval Shipyard Housing Inventory

3. Maintenance

The maintenance which was funded and accomplished through the Mare Island Naval Shipyard Housing Department was similar to the maintenance which was funded and accomplished through NPS, Point Mugu, and China Lake. This included maintenance items such as responding to service calls, routine maintenance, painting, maintenance of grounds and surface areas, and the cleaning of quarters. Maintenance funded and accomplished through Mare Island did not include major repair or renovations.

To accomplish the maintenance requirements at Mare Island, family housing maintenance was outsourced to several contractors. One contract covered the majority of maintenance, while specialty maintenance for items such as wood flooring; vinyl flooring; tub, tile, and shower; interior painting; and exterior painting were contracted under separate contracts. All contracts let by the Housing Department were indefinite quantity type of contracts; a minimum and a maximum amount of maintenance work was specified within the contracts.

Fiscal Year 1993 was the fourth year that housing maintenance had been performed under the main contract. The contracts required that the contractors provide all of the labor, materials, transportation, equipment, tools, supervision, and management necessary to perform the required maintenance.

4. Infrastructure

The infrastructure used to support these contracts was similar to the infrastructure used to support the housing maintenance contracts at Point Mugu and China Lake. The OICC assigned a Contract Specialist, a Facilities Contract Manager, and the equivalent of two and one-half QAEs to carry out and enforce the contracts. The Housing Department maintained two inspectors who performed inspections which resulted in the identification of maintenance work to be

performed by the contractors. Examples of these inspections included the pretermination, termination, make-ready, and check-in inspections as well as inspections within the maintenance and repair inspection program. The Housing Department also retained and performed its operation functions.

E. SUMMARY

In this chapter we have seen that the military family housing maintenance at Point Mugu, China Lake, and Mare Island is quite similar. The similarity of maintenance is a result of the regulations promulgated by OSD and the Department of Navy that govern housing maintenance; it is also a result of the similar number of units maintained, and for the majority of quarters, the similarity in the date of construction of the units.

We have also seen in this chapter that the different installations use different types of contracts to outsource their maintenance requirements. However, the bottom line is how much was spent on the housing maintenance by the Housing Divisions or Departments.

The next chapter will identify the housing maintenance which lends itself to outsourcing. It will also compare the in-house costs of maintenance associated with the Naval Postgraduate School with the costs of outsourcing the maintenance functions at Point Mugu, China Lake, and Mare Island.

IV. DATA ANALYSIS

In the first section of this chapter, family housing maintenance which lends itself to outsourcing will be identified. The second section will review the costs of maintenance recorded for fiscal year 1993 by the Naval Postgraduate Schools' Family Housing Division as well as the outsourcing maintenance costs recorded for Point Mugu's, China Lake's, and Mare Island's military family housing. The third section of this chapter will offer possible explanations of variances among the maintenance costs for which data was available. The final section of Chapter IV will briefly mention concerns which often surface when discussing outsourcing versus maintaining the in-house capability to accomplish maintenance.

A. HOUSING MAINTENANCE COMPATIBLE WITH OUTSOURCING

The previous chapters identified military family housing maintenance which was funded and accomplished through the family housing offices at the Naval Postgraduate School, Point Mugu, China Lake, and Mare Island. This maintenance was similar at each of these installations because their operations were guided and regulated by instructions promulgated by the Office of the Secretary of Defense and the Department of Navy.

Maintenance common to all of these installations included items such as responding to service calls which encompassed the resolution of virtually any type of problem that an occupant could encounter. It also included routine and recurring maintenance items such as the semiannual inspection, adjustment, and filter change of furnaces. Other common maintenance tasks included interior and exterior painting, and the maintenance of grounds and surface areas.

Each installation developed its own method of accomplishing the maintenance required for its family

housing facilities. While the Naval Postgraduate School utilized the skills of in-house personnel and augmented this on-station capability with contracts, Point Mugu, China Lake, and Mare Island outsourced their maintenance functions. Within the three installations which outsourced their maintenance requirements, differences in outsourcing existed.

Point Mugu's maintenance service contract was most comprehensive. It contained both a fixed price and an indefinite quantity portion in the contract. The fixed price and the indefinite quantity portions of the contract provided for the performance of the same type of work. However, the fixed price portion of the contract constituted the minimum amount of services that would be procured, while the indefinite quantity portion acted as an estimation safety net for the amount of maintenance required.

While China Lake's maintenance service contract also consisted of a fixed price and an indefinite quantity portion, the tasks performed under each portion of the contract were not the same as was the case with Point Mugu. Under the fixed price portion of the contract, items such as change of occupancy inspections, the maintenance and repair inspection program, responding to service calls, and the semiannual inspection and adjustment of gas furnaces and air conditioning units were accomplished. This portion of the contract also covered items such as the annual cleaning of roofs and gutters, limited roof repair, grounds maintenance, and work that required less than 16 man-hours or an individual part costing less than $500 to fix. On the other hand, maintenance performed by the contractor under the indefinite quantity portion of the contract included items such as maintenance resulting from change of occupancy inspections, maintenance resulting from the maintenance and repair inspection program, and service calls which required

more than 16 man-hours or an individual part costing more than $500 to fix.

Even though Mare Island also outsourced its military family housing maintenance requirements, it used a different approach than either Point Mugu or China Lake. Not only did Mare Island use a different type of contract but it also used multiple contracts to accomplish the required maintenance. Unlike the combination fixed price and indefinite quantity contracts let by Point Mugu and China Lake, Mare Island's contracts were only indefinite quantity type contracts. A minimum and a maximum amount of Mare Island's maintenance work was specified within the contracts. Among the contracts, the maintenance service contract covered the majority of maintenance, while the specialty contracts provide maintenance for items such as wood flooring; vinyl flooring; tub, tile, and shower; interior painting; and exterior painting.

Another area in which Mare Island differed from Point Mugu and China Lake was in the execution of their inspection programs. Unlike Point Mugu and China Lake whose contracts required that the contractor perform inspections, Mare Island's contractors were not required to perform inspections which identified maintenance requirements. Instead, Mare Island's Housing Department maintained personnel to perform the required inspections.

Regardless of the type, provisions, or number of contracts let by the installations under review, the maintenance funded and accomplished through the various family housing offices provided for the upkeep of the facilities under their purview. Therefore, it should be reasonable to conclude that all maintenance that is funded and accomplished through almost any military installations' family housing divisions and departments lends itself to outsourcing.

B. RECORDED HOUSING MAINTENANCE COSTS

1. Naval Postgraduate School

The total FY93 family housing maintenance costs recorded by the NPS Family Housing Division was approximately $1,517,603. This included $297,652 for maintenance which was contracted out and $1,219,951 for maintenance which was accomplished by in-house personnel. On-station forces were also responsible for the upkeep and control of furnishings under the Family Housing Division's purview. Naval regulations require that the costs associated with the "...control, moving and handling, maintenance, repair, replacement..." of furniture and moveable equipment (furnishings) be recorded separately from the maintenance costs of the housing units [Ref. 20]. The maintenance related costs incurred while performing the upkeep of these furnishings were $38,393. These costs are not included in the total maintenance costs.

The $297,652 associated with outsourced maintenance not only included the costs charged by contractors to perform the maintenance but it also included a six percent Site Inspection and Overhead (SIOH) charge. This six percent charge paid for indirect support of the contracts. These indirect costs included support provided by personnel such as the Service Contract Manager and Quality Assurance Evaluators in the Facilities Maintenance Contracts Division.

The $1,219,951 associated with the maintenance performed by in-house personnel included $701,982 for labor and $517,969 for materials costs. The labor costs included the wages and related costs for the twenty-one personnel in the Housing Maintenance Section. These related costs consist of an additional cost of 42 percent of the wage rates. 26 percent of this additional cost include items such as social security, medicare, FICA, insurance, and pension costs. The other seventeen percent

covered costs associated with items such as sick leave, annual leave, and holiday leave.

Another approach to examining the cost of housing maintenance is by dividing the maintenance into eleven categories. These categories are:

- Service Calls
- Routine Maintenance
- Change of Occupancy Maintenance
- Self Help
- Minor Repair and Replacement
- Specific Job Orders
- Painting
- Exterior Utilities
- Grounds maintenance
- Surface Area Maintenance
- Other Real Property maintenance

Table 4.1 lists the expenditures associated with these categories.

2. Naval Air Weapons Station, Point Mugu

The total FY93 family housing maintenance related costs recorded for Point Mugu's Family Housing Division was approximately $2,253,400. Unlike the Naval Postgraduate School's family housing maintenance costs, Point Mugu's housing maintenance expenditures cannot be broken down by material and labor costs because of the type of contract used.

With the combination of a fixed price and indefinite quantity contract, the contractor agreed to perform defined services under the fixed price portion of the contract for a lump sum amount of money. Therefore, a break down of material and labor costs under this portion of the contract is not available. However, maintenance costs can be broken down by the same eleven categories as outlined in the NPS section. Refer to Table 4.1 for Point Mugu's housing maintenance expenditures in each category.

MAINTENANCE CATEGORY	NPS	PT MUGU	CHINA LAKE	MARE ISLAND
Service Calls	$ 71,992	277,100	244,900	422,060
Routine Maintenance	$ 454,638	164,100	519,600	231,591
Change of Occupancy	$ 25,180	172,700	307,800	98,920
Self Help	$ 1,886	26,300	58,700	93,834
Minor Repair & Replacement	$ 339,404	460,300	1,324,400	279,970
Specific Job Orders	$ 187,796	N/A	N/A	27,824
Painting	$ 167,823	455,500	375,900	129,038
Exterior Utilities	$ 31,293	18,500	167,000	12,126
Grounds	$ 167,927	177,700	159,100	372,765
Surface Areas	$ 61,588	354,500	59,700	83,592
Other Real Property	$ 8,073	146,700	N/A	129,600
Total:	**$1,517,600**	**2,253,400**	**3,217,100**	**1,881,320**
Total Number of Units	891	883	812	948
Total Dwelling Square Footage	1,068,912	1,011,451	968,874	1,061,999

N/A = Not Available

Table 4.1 Comparison of FY93 Maintenance Related Housing Expenditures

3. Naval Air Weapons Station, China Lake

The total FY93 family housing maintenance related costs recorded for the China Lakes's Family Housing Division was approximately $3,217,100. China Lake also let a combination fixed price and indefinite quantity type contract when it outsourced its housing maintenance. The similarity in contact type between China Lake and Point Mugu resulted in accounting for expenditures in a similar fashion. The break down of material and labor costs was not required for accounting purposes. However, maintenance costs were recorded by categories. Table 4.1 contains China Lake's maintenance related housing expenditures.

4. Mare Island Naval Shipyard

The total FY93 family housing maintenance related costs recorded by Mare Island's Family Housing Department was approximately $1,881,320. Mare Island's housing maintenance related expenditures were also recorded by category. These expenditures, listed by category, are displayed in Table 4.1.

C. EXPLANATION OF VARIANCES

The bottom line totals in Table 4.1 reveal that the overall costs incurred for military family housing maintenance was less for the Naval Postgraduate School than for Point Mugu, China Lake, or Mare Island. This seems to imply that the NPS maintenance method of primarily relying on in-house maintenance personnel augmented by outsourcing is more cost effective than the Point Mugu, China Lake, and Mare Island method of contracting out housing maintenance functions. However, the data contained in Table 4.1 raises the question of why do such wide variances or differences in recorded expenditures among some of the categories and the total costs exist. The following subsections will discuss four possible reasons for the differences or variances.

To facilitate the comparison and discussion of the maintenance costs among these installations, Tables 4.2 and

4.3 were developed. Table 4.2 depicts the Table 4.1 expenditures in each category as a percentage of the total maintenance costs for each research site.

Table 4.3 consists of a comparison of expenditures by category among the four installations using NPS as a benchmark. The figures in Table 4.3 reflect Point Mugu, China Lake, and Mare Island expenditures in each category as a percentage of NPS expenditures in each respective category. Note that in Table 4.3 the categories of Grounds and Other Real Property have been combined. The rational for this combination will be explained later in the chapter.

1. Variances Among Categories

Even though the figures in Table 4.1 suggest that, overall, housing maintenance costs less when performed by on-station personnel, Tables 4.1 and 4.2 do not reveal a consistent pattern of reduced costs for NPS across all or even a vast majority of categories. For example, a comparison between NPS and Mare Island reveals that the Naval Postgraduate School Housing Division's expends more in five of the eleven categories. The differences in expenditures by category are readily apparent in Table 4.3. Some of these variances are significant in amount.

To illustrate, Mare Island's expenditures on Service Calls appears to be more than five times that of NPS's expenditures on Service Calls. Another obvious difference in costs occurs in Routine Maintenance. While NPS recorded costs almost twice that of Mare Island, it only recorded cost of about half of what China Lake spent. In the category of Change of Occupancy it appears that Mare Island, Point Mugu, and China Lake spent approximately four times, seven times, and twelve times, respectively, that of what was spent by the Naval Postgraduate School. While, in the category of Specific Job Orders, NPS spent almost seven times the amount that Mare Island spent.

Maintenance Category	NPS	PT MUGU	CHINA LAKE	MARE ISLAND
Service Calls	5%	12%	8%	22%
Routine Maintenance	30%	7%	16%	12%
Change of Occupancy	2%	8%	9%	5%
Self Help	0%*	1%	2%	5%
Minor Repair & Replacement	22%	21%	41%	15%
Specific Job Orders	12%	N/A	N/A	2%
Painting	11%	20%	12%	7%
Exterior Utilities	2%	1%	5%	1%
Grounds	12%	14%	5%	27%
Surface Areas	4%	16%	2%	4%
TOTAL:	100%	100%	100%	100%

N/A = Not Available *NPS Self Help = .12%.

Table 4.2 Percentage Comparison of FY93 Maintenance Related Housing Expenditures

Maintenance Category	PT MUGU	CHINA LAKE	MARE ISLAND
Service Calls	385%	340%	586%
Routine Maintenance	36%	114%	51%
Change of Occupancy	686%	1222%	393%
Self Help	1394%	3112%	4975%
Minor Repair & Replacement	136%	390%	82%
Specific Job Orders	N/A	N/A	15%
Painting	271%	224%	77%
Exterior Utilities	59%	534%	39%
Grounds	184%	90%	285%
Surface Areas	576%	97%	136%

NPS used as benchmark. N/A = Not Available.

Table 4.3 Comparison of Maintenance Cost by Category

Even though Table 4.3 contains significant differences in recorded costs for these installations across all categories, only one more category will be singled-out to illustrate the variances. The final category which accents the significant differences in costs is the category of Self Help. NPS reports spending approximately $2,000 while Mare Island reports a cost of almost $94,000. This represents a variance between these two installations on the magnitude of a factor of 50. Said another way, Mare Island reports spending approximately 50 times that of what NPS reports spending in the category of Self Help.

The primary explanation for such wide differences in spending among categories is that the various installations do not record maintenance costs the same way. That is to say, even though each category is specifically defined by Naval regulations, costs for the same type or category of maintenance seem to be recorded or defined differently by these installations.

For example, in recording maintenance costs incurred as a result of a call for service by an occupant at NPS, both

the category of Service Calls and Routine Maintenance could be charged. If the maintenance required as a result of an occupant's call for service is not completed upon the initial visit made by maintenance personnel, then the subsequent visit or visits required to complete repairs could be charged to Routine Maintenance. This was not the cost accounting method used by Mare Island.

This difference in the recording of maintenance expenditures helps explain the significant difference in costs among categories. If the categories of Service Calls and Routine Maintenance are combined at NPS and Mare Island, then instead of having expenditures in the NPS Service Call category which is significantly lower and a Routine Maintenance category almost double that of Mare Island's, the combined totals for these categories would reflect a difference of less than 20 percent.

This same type of inconsistency in attributing costs to categories can also be seen in the categories of Change of Occupancy and Specific Job Orders. Much of the Naval Postgraduate School's Specific Job Order expenditures result from change of occupancies. Again, by combining these two categories, instead of having expenditures in the NPS Change of Occupancy category of approximately one-fourth and a Specific Job Orders category of approximately six times that of Mare Island's, the combined totals for these categories would reflect a difference of less than 50 percent. While this may still result in a sizeable variance, it does not compare to the variances indicated when the categories are separate.

In addition to the above two examples of the installations not accounting for maintenance costs the same way, the "not available" in the category of Other Real Property under China Lake is a reflection of this phenomena. Costs that should be accounted for under this category are reflected under the category of Grounds. The combining of

these two categories by China Lake drove the combining of these categories, for comparison, in Table 4.3.

These examples of differences in categorizing or defining housing maintenance costs are probably not the only instances of this problem. However, they do serve to highlight and explain some of the variances among the categories listed.

Another obvious difference in spending among the installations is in the category of Self Help. The Self Help Program is designed to make materials available to military family housing residents, so that the occupants can perform basic maintenance on their units. Examples of materials that could be provided to residents is screen material for window screens, cover plates for electrical outlets, faucet washers, and grass seed. Basically, the occupants are encouraged to perform maintenance which does not require trade skills.

While guidelines for the Self Help Program are promulgated through Naval regulations, each installation has some leeway in the execution of the program. Among the installations under review, there were no significant differences noted in this program. The large difference in recorded costs between NPS and the other installations was a result of NPS not attributing labor costs to the Self Help category. While the other installations accounted for the labor costs associated with operating the Self Help Program, NPS did not. NPS did not dedicate separate personnel or account for labor costs attributable to Self Help. Instead, the Self Help labor costs at NPS were spread across many of the other categories and not documented.

The lack of consistent definition or categorization when recording housing maintenance costs among these four installations makes it difficult to conduct a comparison or analysis of expenditures by category. However, even though the maintenance costs recorded in each of the eleven

categories for these four installations do not necessarily reflect the cost of similar types of maintenance, the aggregate of these categories could prove useful to compare. Therefore, the next subsection will examine the variances in the total housing maintenance costs recorded for the Naval Postgraduate School, Point Mugu, China Lake, and Mare Island.

2. Total Cost Variances

a. *Number and Size of Unit Variances*

When comparing the maintenance costs of these installations, the size of the facilities being maintained should be considered. As indicated in previous chapters, the number of housing units maintained by Point Mugu, China Lake, and Mare Island were comparable with the number of units maintained by the Naval Postgraduate School. Point Mugu maintained 883 units, China Lake maintained 812 active units, Mare Island maintained 948 units, and NPS maintained 891 units.

China Lake maintained the least number of units but had the highest expenditures. This translates to approximately 91 percent of the number of units that NPS maintains. On the other hand, Mare Island maintained the greatest number of units, and they represent approximately six percent more units than the number of units that NPS maintained. This relatively narrow range in the number of units maintained by these installations should not impact the total maintenance costs. Economies of scale for housing maintenance at these installations should be relatively equivalent. Therefore, total maintenance costs should be relatively unaffected.

However, given the total units maintained by each installation and the total maintenance costs, it is useful to compare the average maintenance cost per unit among these installations. Table 4.4 and Figure 4.1 depict this comparison.

	NPS	POINT MUGU	CHINA LAKE	MARE ISLAND
Number Of Units	891	883	812	948
Maintenance Cost per Unit	$1,703	$2,552	$3,962	$1,985
Percent of NPS Cost	100%	150%	233%	117%

Table 4.4 Comparison of Maintenance Cost Per Unit

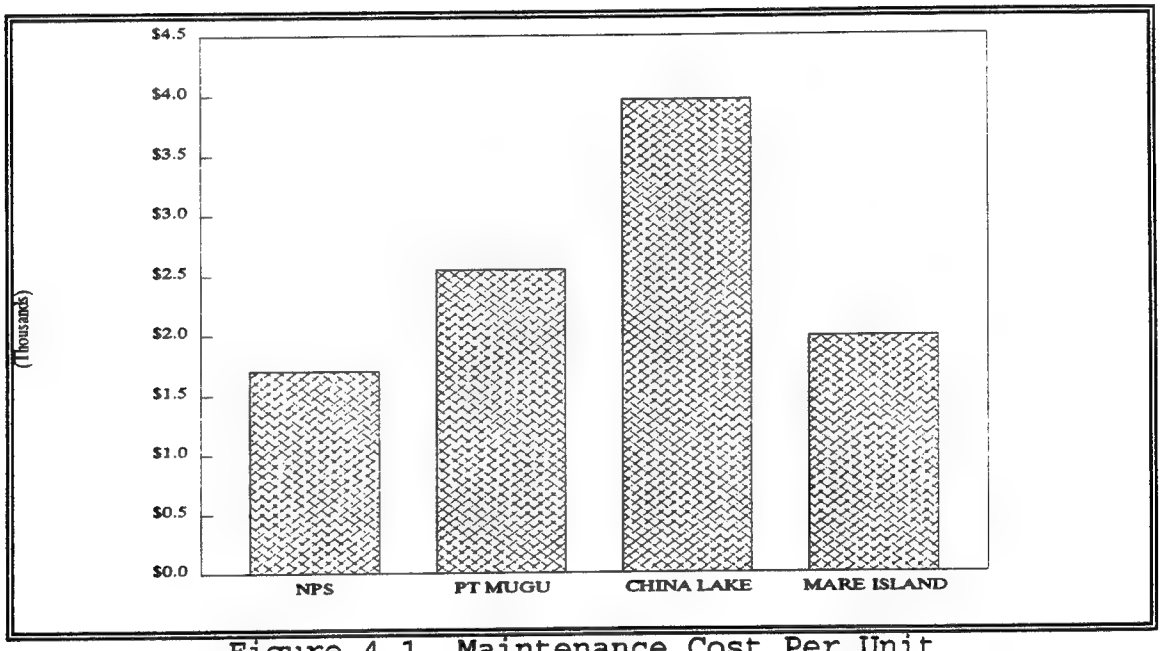

Figure 4.1 Maintenance Cost Per Unit

Figure 4.1 graphically illustrates the vast difference in maintenance cost per unit among these four installations. China Lake appears to expend more than twice the maintenance cost per unit than does NPS. On the other hand, Point Mugu and Mare Island appear to incur approximately 50 and 17 percent, respectively, more in maintenance cost per unit than does NPS.

Another approach to examining the cost of maintenance is by comparing the total interior square footage of the housing units. The total interior space of the dwellings maintained by the NPS Family Housing Division is approximately 1,068,912 square feet. The total square footage of the units at Point Mugu, China Lake, and Mare Island is approximately 1,011,451; 968,874; and 1,061,999 square feet respectively. The total number of square feet of the dwellings maintained by Point Mugu, China Lake, and Mare Island is within ten percent of the amount of dwelling square footage maintained at NPS. Again, economies of scale should be relatively equivalent across this narrow range of total unit square footage among the installations. Therefore, if there is any variance in maintenance costs due to the difference in total square footage maintained, it should be negligible.

However, it is useful for comparison purposes to illustrate the variances in maintenance costs by examining the average maintenance cost per dwelling square foot. Table 4.5 and Figure 4.2 depict this comparison.

Figures in Table 4.5 indicate that NPS expends less per dwelling square foot than the other installations. In fact, the expenditures, as measured by maintenance costs per square foot, appears to be quite varied. While NPS spends approximately $1.42 per square foot, it appears that Point Mugu, China Lake, and Mare Island spends approximately $2.23, $3.32, and $1.77 respectively. This represents expenditures per square foot of 25 to 134 percent over NPS maintenance cost per square foot. Figure 4.2 graphically represents these variances.

b. Labor Rate Variances

When comparing costs among installations located in different geographic locations, the possible difference in economic conditions should be considered. Differences in economies at these four sites could cause variances in labor

	NPS	POINT MUGU	CHINA LAKE	MARE ISLAND
Total Dwelling Square Footage	1,068,912	1,011,451	968,874	1,061,999
Maintenance Cost per Sq Ft	$1.42	$2.23	$3.32	$1.77
Percent of NPS Cost	100%	157%	234%	125%

Table 4.5 Comparison of Maintenance Cost Per Square Foot

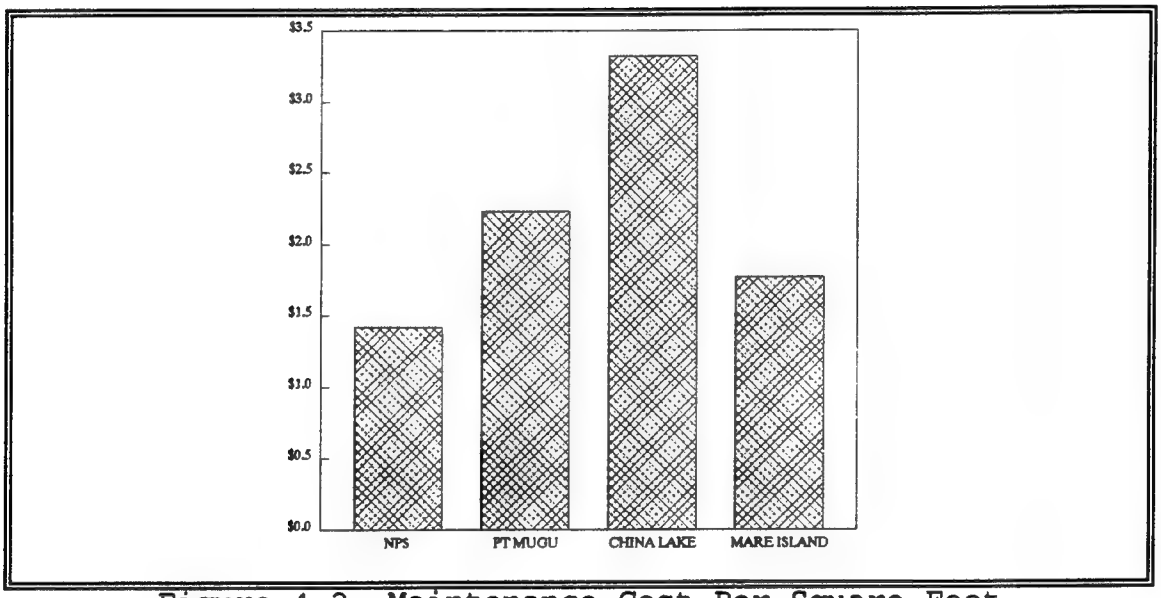

Figure 4.2 Maintenance Cost Per Square Foot

rates. Since the cost of labor accounts for a major portion of the maintenance expense, a difference in labor rates among these installations could result in a sizeable variance in the total cost of housing maintenance.

As pointed out earlier in this chapter, the Naval Postgraduate School was the only installation in this group of four commands where total labor costs were recorded separately from other maintenance costs. As recorded by the NPS Family Housing Division, labor costs accounted for

$701,982 of the total maintenance related cost of $1,517,600. Therefore, approximately 46 percent of the family housing maintenance related expenditures at NPS was for labor.

While the other installations may not incur precisely the same percentage of labor costs as NPS, given the similarity in the type of maintenance required and in the size and number of units at each installation, it is reasonable to expect that the proportion of labor required to carry out housing maintenance among these installations is similar to that of NPS. With this probable similarity in the proportion of labor, an examination and comparison of the unit cost of labor at each location should highlight possible variances in the total maintenance costs.

The Division of Wage Determinations within the Department of Labor routinely (approximately annually) publishes minimum wage rates which contractors must pay their employees when furnishing services or performing maintenance services for the federal government. These rates are developed for specific geographic and economic areas where federal agencies are contracting for services. Generally, these geographic and economic areas are defined by counties. The rates determined by the Department of Labor are intended to ensure that contractors providing services to a federal agency compensate their workers at the prevailing rate for the locality in which the work is being performed. This compensation includes both wages and fringe benefits.

By comparing the Department of Labor wage determinations for a representative sample of the type of workers used to perform military family housing maintenance at the installations being compared, variances in the total maintenance costs as a result of labor costs should be highlighted. To make this comparison, the crafts of plumber, electrician, and general laborer will be used to

comprise a representative sample of skills required to perform the housing maintenance.

The minimum wage rates for a plumber, an electrician, and a general laborer as prescribed by the Department of Labor for each installation under review are depicted in Table 4.6. The labor rates that the Department of Labor published for use in the area which the Naval Postgraduate School is located were used to compare the rates of the other installations. The variances listed in Table 4.6 are the result of this comparison.

Since the exact division of labor among the trades used to accomplish the required maintenance is not known, it is not possible to adjust the total maintenance costs for the differences. However, while a precise adjustment to the total maintenance cost at the installations cannot be made, an examination of these variances can provide a means to

Installation	**Minimum Labor Rate By Category**			**Overall Impact On Total Maintenance Cost**
	Plumber	Electrician	General Laborer	
NPS	$15.13	$15.82	$10.85	**Benchmark**
Pt. Mugu	15.85	16.43	9.74	
Variance	5%	4%	-10%	**Not Significant**
China Lake	15.42	15.99	10.90	
Variance	2%	1%	0.5%	**Not Significant**
Mare Island	15.91	16.57	10.37	
Variance	5%	5%	-4%	**Not Significant**

Table 4.6 Selected 1993 Minimum Wage Rates and Variances

gauge the likely effect on the total housing maintenance costs at these Naval installations.

The representative sample of trade wage rates in Table 4.6 indicates that the unit cost of labor at NPS was approximately equal to that of China Lake. Variances in wage rates, as measured against NPS wage rates, ranged from one-half to two percent. On the other hand, variances for Mare Island and Point Mugu encompassed a wider range. Variances in the representative sample of trade wage rates at Mare Island ranged from approximately negative four to positive five percent. Point Mugu's variances indicate an even wider range which extends from approximately negative ten to positive five percent.

Again, it is not possible to adjust the total labor or maintenance costs at these installations based on this comparison. However, this comparison does point out that, overall, there are no significant economic differences in the areas in which these installations are located. Therefore, it would not be reasonable to attribute a significant or even small portion of the lower NPS total housing maintenance costs, when compared with Point Mugu, China Lake, and Mare Island, to reduced labor expense.

c. Dwelling Condition Variances

Another difference that might impact the cost of maintaining housing at these installations is the overall structural condition of the family housing units. If dwellings among the various installations were not maintained through out their service lives at equivalent levels, it would be reasonable to expect units that received lower levels of upkeep over their lives to require more maintenance costs in the later stage of their life cycles as a result of the earlier neglect. While a determination, thus comparison, of the overall structural condition of the housing units at these installations may be difficult, by relying on the estimates of professionals in the housing and

maintenance fields, a reasonable comparison may be made. This comparison will not provide the ability to make a precise adjustment to the cost of maintenance at these installations. However, it should provide an indication of which installations' total maintenance costs should be higher as a result of the overall condition of the dwellings.

To estimate the structural condition of units at NPS, Point Mugu, and China Lake, the assessment of Housing Planners from the Western Division, Naval Facilities Engineering Command (NAVFACENGCOM) and from architectural firms contracted by NAVFACENGCOM will be used. An assessment by a Mare Island Housing Inspector will be used to estimate the overall structural condition of the dwellings at Mare Island.

In an effort to improve the quality of life of Naval personnel, the Chief of Naval Operations (CNO) initiated a Neighborhoods of Excellence Program with the purpose of improving military housing neighborhoods to a level which is "...comparable to contemporary private sector standards" [Ref. 21]. One of the initial steps in this Neighborhoods of Excellence Program is for the Housing Officials at the NAVFACENGCOM to contract architectural firms to develop Comprehensive Neighborhood Plans (CNP) for military family housing areas maintained by installations which are part of this quality of life initiative.

When developing a CNP, the architectural firms normally conduct an existing conditions survey and analysis of the housing areas and dwellings. When performing an analysis of existing conditions of the units, the firms usually select a random sample of each type of unit to inspect and rate. During this process, areas such as the exterior, interior, mechanical, and electrical components of the dwellings are analyzed. The rating scheme used to grade

the condition of the dwellings contains five possible ratings. These rates are: good, good-fair, fair, fair-poor, and poor.

To develop the Comprehensive Neighborhood Plans for the Naval Postgraduate School and Point Mugu, Roesling Nakamura Architects Inc. was contracted. A review of the draft CNP issued in the Summer of 1994 by Roesling Nakamura Architects Inc. indicates that the family housing units at NPS are in fair condition. However, a review of the draft CNP for Point Mugu shows no rating of the housing units.

According to Mr. Mike Axley, Planner-in-Charge, Western Division, NAVFACENGCMD, the units at Point Mugu were estimated to be in good condition prior to the architectural firm being contracted to perform the Comprehensive Neighborhood Plan. Therefore, there was no reason to include the requirement of a structural survey and analysis of the units maintained by Point Mugu in the contract since officials at the Western Division, Naval Facilities Engineering Command had already assessed the condition of the dwellings as good.

To develop the Comprehensive Neighborhood Plan for China Lake, MWM Architects, Inc. was contracted. A review of the draft CNP issued in the Summer of 1994 by MWM Architects, Inc. indicates that, overall, the housing units at China Lake are in fair to fair-poor condition.

The Neighborhoods of Excellence Program was not initiated at Mare Island because the Mare Island Naval Shipyard is scheduled for closure in April 1996. Since Mare Island was not part of the Neighborhoods of Excellence Program, no architectural firm was contracted to perform a CNP. Therefore, there is no survey and analysis of the family housing units maintained by Mare Island's Housing Department available to determine the condition of the dwellings. However, the Mare Island Deputy Housing Director, whose previous position was that of Housing

Inspector at Mare Island, stated the overall condition of the units under the purview of the Mare Island Housing Department to be good [Ref. 22].

To summarize, based on the assessments of professionals in the housing and maintenance fields, collectively, the condition of the military family housing units at NPS is fair. At China Lake, the overall condition of the units is fair to fair-poor, and the collective condition of the units at both Point Mugu and Mare Island is good. Based on these assessments and the expectation that units which are in better structural condition require less repair, one would expect that the total maintenance related costs at Point Mugu and Mare Island to be less than the costs at NPS and China Lake. However, this was not the case.

Figures in Table 4.1 indicate that even though the condition of dwellings at NPS are inferior to that of Point Mugu and Mare Island, the NPS Housing Division expends less than Point Mugu or Mare Island. On the other hand, China Lake's units which are in a poorer condition than Point Mugu, Mare Island, and NPS spends substantially more on housing maintenance than these installations. This seems to be consistent with the premise that units which are in worse overall condition cost more to maintain.

Based on the difference in ratings of the overall dwelling condition, it is difficult to estimate what the difference in maintenance related expenditures should be. However, the expected outcome of housing which was assessed with a lower condition rating costing more to maintain does not seem to materialize at the Naval Postgraduate School. While it is difficult to determine why the expected outcome does not materialize, one possible explanation for this result is that maintenance at NPS was performed more efficiently than at the other installations.

In the case of China Lake, two additional factors should be considered when trying to account for the variances of the total maintenance costs. The first additional consideration should be that during FY93 China Lake's Housing Division was trying to prepare over 50 additional units for occupancy that had not been used in recent years use. A major portion of these costs would be accounted for under the category of Minor Repair and Replacement. An estimate of these additional costs was not available. However, if China Lake's Minor Repair and Replacement expenditures are adjusted to fall within the range of the other three installations, about $300,000 to $500,000, a reduction of approximately $800,000 to $1,000,000 could be made to the total maintenance costs. Based on the other possible causes for variances mentioned, this would put China Lake's total maintenance costs in an expected range of $2.2 to 2.5 million. This would be more in line with their FY92 expenditures which were estimated to be approximately $2.4 million.

The second additional consideration, as mentioned in Chapter III, results from FY93 being China Lake's first year under the present service maintenance contract. Even though housing at China Lake has been contracted out for a number of years, there are additional costs incurred when engaging a new contractor. These additional costs are chiefly a result of a new contractor needing time to learn and become intimately familiar with the required maintenance and operations at its new work site. The contractor's learning curve should result in more efficient, thus less costly, maintenance operations during the execution of the contract in subsequent years. However, in the early stage of the contract, costs should be expected to be higher than the costs of a contractor or on-station personnel which have been performing the same maintenance functions at the same installations year after year.

d. Turnover Variances

Another difference among these installations that might impact the cost of up-keeping housing is the rate of the turnover of the units. It would be reasonable to expect that a higher annual number of units being turned over would result in higher costs. These higher costs would likely be reflected across many of the eleven categories.

Two areas in which a higher number of turnovers would have a direct impact are in the number of inspections and in the resulting change of occupancy maintenance. An increased number of turnovers or change of occupancies would result in a higher number of inspections. Recall from Chapter II, that each change of occupancy requires a minimum of four inspections. Subsequently, this would also result in an increased number of change of occupancy maintenance requirements. Thus, an increase in overall maintenance costs would result.

There are at least two other areas which could be impacted by a higher turnover rate. It would be reasonable to expect the number of service calls to increase as change of occupancies increase. As new occupants move into a unit and become intimately familiar with their new home, after the excitement or anxiety of the move has passed, they tend to notice the small deficiencies that were overlooked during the move-in inspection. This phenomenon is almost like buying a new car. While people are at the car dealer, they look over the car to ensure that it is good condition. However, with the car sales person looking over their shoulder and with the excitement or anxiety of buying the car the little imperfections are missed. People do not often become aware of the discrepancies until they drive the vehicle for a couple of weeks, or until they wash the vehicle a few times. However, once they notice the deficiencies, they expect the car dealer to make corrections.

This same cycle often occurs when new occupants move into a unit. With the inspector acquainting them with their new home and responsibilities that go with it, the occupants often miss the little discrepancies. However, within the first couple of weeks, they notice the little maintenance requirements that were initially overlooked, and they call for service.

The second area which could be impacted by a higher number of turnovers falls within the category of Self Help. Recall that Self Help makes available minor maintenance repair items to occupants. These items can range from light switch plates to grass seed. Considering human nature, it is reasonable to expect that what was acceptable to one occupant is not necessarily acceptable to the next occupant.

For example, while a window blind that might not close completely was okay with the former occupant because they never used it, it is not adequate for the new occupant who plans to use it daily. Another example of this might be seen in the maintenance of the yard. While the grounds were acceptable to the former occupant, the new occupants hobby may be gardening. Therefore, the new occupants make use of the soil, mulch, grass seed and whatever else is provided by Self Help to encourage the beautification of the neighborhood.

Both of these examples would result in an increased cost in housing maintenance as a result of a higher turnover rate. While these phenomena are not formally documented, an informal survey and observation were conducted. The results of which lend support to both of these scenarios.

Again, a higher turnover rate could explain some of the differences in the total costs of family housing maintenance among the Naval Postgraduate School, Point Mugu, China Lake, and Mare Island. While comparing the number of

annual change of occupancies for these installations will not allow for a precise dollar adjustment to the total maintenance costs, it should indicate in which direction the total costs could be adjusted.

Table 4.7 depicts the annual number of change of occupancies for the four installations. The Naval Postgraduate School reports approximately 410 change of occupancies per year. At Point Mugu, approximately 350 units are turned over annually. At China Lake, the number of change of occupancies is approximately 250. And, Mare Island reports approximately 600 change of occupancies.

	NPS	POINT MUGU	CHINA LAKE	MARE ISLAND
Number of Turnovers	410	350	250	600
Number Of Units	891	883	812	948
Unit Turnover Frequency (Years)	2.17	2.52	3.25	1.58
Percent of NPS Turnover Rate	100%	84%	50%	1.27%

Table 4.7 Comparison of Change of Occupancies Per Unit

By dividing the number of units that each installation maintains by the number of annual turnovers or change of occupancies, the average frequency with which each unit is turned over can be determined. Once the unit turnover frequency is computed, a comparison of these installations can be made, and the impact on total maintenance costs determined. Table 4.7 contains the results of these computations.

Keep in mind, that a higher (numerically) unit turnover frequency denotes a longer period of time between

change of occupants per unit. Therefore, in Table 4.7 in the row labeled Unit Turnover Frequency, the higher the number, which represents years, the fewer change of occupancies. For example, Mare Island's frequency of 1.58 years results in more than twice the rate of unit turnovers that China Lake experiences with a frequency of 3.25 years.

Figure 4.3 graphically illustrates the comparison of unit turnover frequencies among NPS, Point Mugu, China Lake, and Mare Island. Again, NPS was used as the 100 percent benchmark. As seen in Figure 4.3, for every change of occupant per unit at NPS, less than one change of occupant per unit occurs at Point Mugu; one-half a change of occupant per unit occurs at China Lake; and more than one change of occupant per unit takes place at Mare Island.

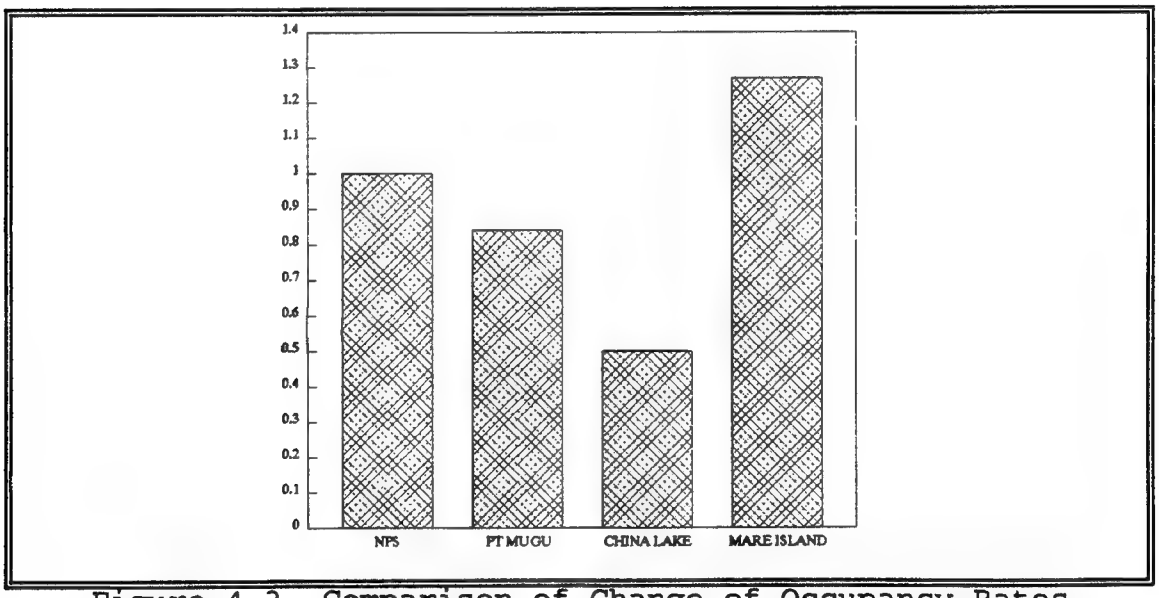

Figure 4.3 Comparison of Change of Occupancy Rates

Again, at a glance, Figure 4.3 provides an effective comparison. It can easily be seen that, on average, occupants at China Lake reside in their units twice as long as personnel at NPS. On the other hand, occupants at NPS reside in their units more than one and a quarter the length as families at Mare Island.

Based on the premise that the higher the frequency a unit is turned over the more maintenance costs are incurred, one would expect that more change of occupancy related costs should be incurred by Mare Island than at NPS. On the other hand, it would be expected that Point Mugu and China Lake would incur less change of occupancy related maintenance costs than NPS. While these conclusions do not allow for a precise adjustment to the total maintenance costs at these installations, it does provide another gauge to determine in which direction the overall maintenance costs should gravitate.

3. Summary of Variances

In the previous two subsections, possible reasons for the variances and their effect on total family housing maintenance costs among the Naval Postgraduate School, Point Mugu, China Lake, and Mare Island have been offered. Table 4.8 summarizes the impact of the identified variances.

While the variance caused by the difference in which the installations record their expenditures among categories significantly affects expenditures listed or attributed to individual categories, it does not change the bottom line total maintenance costs.

The second possible cause of variances, the difference in the number and size of units maintained, also should not affect the bottom line total cost of maintenance. Because of economies of scale, the narrow range in the number of units and in their total square footage should make no significant difference in total maintenance costs.

The third possible cause of variances, the difference in economies as measured by minimum labor rates, should also have no significant impact on the total cost of maintenance. As illustrated earlier, the labor rates were approximately equivalent.

	Installations			
	NPS	Pt. Mugu	China Lake	Mare Island
Total $ Maintenance	1,517,600	2,253,400	3,217,100	1,881,320
Variance Among Categories	No Change	No Change	No Change	No Change
# & Size Variance	No Change	No Change	No Change	No Change
Labor Rate Variance	Benchmark	No Significant Change	No Significant Change	No Significant Change
Condition Variance	Benchmark	↓	↑	↓
Change of Occupancy Rate	Benchmark	↑	↓	↓

Table 4.8 Variance Effects On Total Maintenance Costs As Measured Against NPS

The last two variance causes should affect the total housing maintenance costs. The fourth variance mentioned, the condition variance, resulted from the difference in the condition of the dwellings. While this study does not provide for a specific estimate of the dollar impact associated with a change in the condition rating of the dwellings, it does indicate which direction maintenance costs should gravitate as condition ratings change from poor to good.

The final possible variance cause, the change of occupancy rate, highlighted some of the additional costs expected with a higher unit turnover rate. Again, this

study did not provide for a specific estimate of the dollar impact associated with a change in the turnover rate. However, it did prove useful to gauge the expected direction of the total maintenance costs.

D. CONCERNS ASSOCIATED WITH OUTSOURCING

Two concerns often arise when discussing outsourcing versus maintaining the in-house capability to accomplish maintenance. The first concern is a perceived loss of flexibility in the use and scheduling of maintenance personnel. The second concern which often surfaces is the potential loss of the ability to reconstitute the in-house capability of performing maintenance once the maintenance function has been contracted out.

1. Loss of Management Flexibility

When contracting out a function, the concern of the loss of control of the work flow is often present. In a department which is service oriented, the environment fluid, and where the service provided intimately affects the daily lives of the customers, i.e., family housing, it is natural for management to seek to possess as many tools as possible to accomplish the mission.

The perception of management flexibility often accompanies the employment of on-station personnel to accomplish family housing maintenance. Management has but to pick-up the telephone and relay the unforeseen immediate maintenance requirement to in-house personnel for resolution of the problem. Conversely, the perception of the loss of flexibility often accompanies outsourcing a function. When an unforeseen requirement surfaces, management must interact with an outside organization, the contractor, for resolution of the problem. If the requirement is not part of the contract, then management must relay the requirement through the contacting office who then interacts with the contractor.

These are often the perceptions which accompany maintaining in-house personnel and outsourcing. However, the bottom line, whether on-station personnel or contractors are used, seems to be the quality of the contract between housing officials and maintenance personnel. When making use of on-station personnel, there is no formal contract. However, there is an unwritten contract between the supervisor of the maintenance personnel and housing officials. If this relationship is poor, then the flexibility which is often associated with in-house personnel is questionable.

The same holds true with the relationship between the government and the contractor. The contract defines the formal relationship between these two entities. If it is poorly written or if it does not effectively define all the requirements, then the likelihood of housing officials enjoying the necessary flexibility is minimal. On the other hand, if the contract defines the requirements well and if the government and the contractor are sensitive to each other's needs, then responsiveness is likely to be present.

Regardless of the method used to accomplish housing maintenance, the quality of the contract, formal or informal, between housing officials and maintenance personnel determines flexibility. If the quality of the contract, for whatever reason, is poor, then management's choice of tools to respond to any given situation is greatly reduced.

2. Reconstitution of On-Station Forces

A concern which often surfaces when discussing outsourcing is the potential loss of the ability to reconstitute the in-house capability of performing the function. To discuss this concern, a look at what happens to the in-house personnel once a function is outsourced is helpful.

When a function such as housing maintenance is contracted out, the displaced workers have a few options to exercise. If the worker has enough years of government service, then the worker could opt for early retirement. Another option that may be open to the worker is employment with the contractor who won the maintenance contract. If the contractor does not already possess the necessary work force to fulfill the contract, then the displaced government maintenance worker has priority over other possible new employees.

A third option open to the soon to be unemployed government worker is to find similar government service elsewhere. This could be locally, or it could require the worker to move across country. Another option open to the worker is for him or her to find employment elsewhere. This could be locally, or it could require a move. It could be employment of similar nature to his or her government service, or it could be employment in some other field. The final option that will be mentioned which is open to the worker is unemployment. The worker may not be able to find a job, and remain unemployed.

At some point in time after a function has been outsourced, the government may determine that it would be prudent to start performing the function in-house. Reasons for this decision could vary from contacting out becoming cost prohibitive to the ceasation of the existance of a viable contractor to provide the required service. Regardless of the reason, the government is now in the position of trying to reconstitute the expertise to perform the function in-house.

The government's ability to reconstitute the desired in-house capability is greatly affected by the options exercised by the government workers whom had performed the function prior to it being outsourced. This is also a function of time. If the maintenance has been outsourced

for only a short period of time prior to the reconstitution decision, then it is more likely that the required workers are available. Couple this with the possibility that many of the former government workers went to work for the contractor which the government engaged to perform the function, and reconstitution may not be too difficult. The corporate knowledge and manpower is still available.

On the other hand, if a great deal of time has elapsed, it is likely that more of the former government maintenance workers have moved out of the area or that they have obtained a position in their current jobs which they are not willing to leave. If this is the case, then the government could find itself in the uncomfortable position of not being able to effectively reconstitute the desired in-house capability.

This second scenario could result in two outcomes. First, it could result in the government having to rely on an inadequate or overpriced contractor because personnel are not available to reconstitute the desired function. Second, increased start-up and maintenance costs are incurred as a result of having to muddle through or reinvent the maintenance process. Either of these possible outcomes puts the government at a disadvantage and their probability should be weighed prior to the initial outsourcing decision being made.

The fifth and final chapter of this study will contain a summary of this study. It will also provide conclusions drawn from the analysis in this chapter. The final sections in Chapter V will contain recommendations and suggestions for areas of further research.

V. CONCLUSIONS AND RECOMMENDATIONS

The first section of this chapter will provide a brief summary of the objective and the principal methodology used in this study. In the second section, conclusions drawn from the analysis in Chapter IV will be presented. The third section will contain recommendations based on the research accomplished. And the fourth and final section of this chapter will offer suggestions for possible areas of further research.

A. SUMMARY

The objective of this research was to determine if it would be beneficial to retain the in-house capability to perform maintenance of the military family housing under the purview of the Naval Postgraduate School's Family Housing Division. The alternative to this status quo would be to eliminate the in-house capability and outsource the required maintenance.

A determination to this question is particularly significant at this point in time. This significance stems from the nearly tripling, as of 1 October 1994, of the number of housing units under the purview of the NPS Family Housing Division. The resulting increase in maintenance responsibilities will significantly increase the resources managed and utilized by the Family Housing Division. Thus, the determination of which method of maintaining military family housing is more cost effective should enhance the economical use of the NPS Family Housing Division's resources over an indefinite period and result in significant savings.

The primary research question considered in this study was: Is it cost beneficial to outsource the Naval Postgraduate School's military family housing maintenance requirements? To address this question a comparison of maintenance and costs between NPS and three other Naval

installations was made. This comparison provided the means to answer the secondary question: What family housing maintenance functions lend themselves to outsourcing? It also provided a means to estimate which method of housing maintenance would be more beneficial for NPS.

B. CONCLUSIONS

Based on this comparison, and as indicated in Chapter IV, the maintenance funded and accomplished through the NPS family housing office may be outsourced. This observation was reached based on the similarity of housing maintenance requirements at NPS and that of Point Mugu, China Lake, and Mare Island which outsourced their maintenance. This parrallelism in requirements resulted from the common sources of instruction which regulates Naval family housing maintenance operations and from the reasonable likeness in the number, size, and condition of the dwellings as demonstrated in Chapter IV. While Point Mugu, China Lake, and Mare Island must have found it more cost effective to contract out their maintenance requirements, outsourcing does not seem appropriate for the Naval Postgraduate School.

Based on the data and analysis presented in Chapter IV, the answer to the primary research question is that it should be cost beneficial to maintain the in-house capability to meet the Naval Postgraduate School's military family housing maintenance requirements. **Outsourcing at NPS does not appear to be cost beneficial.**

As indicated in Table 4.1, all three installations which relied on outsourcing to meet their family housing maintenance requirements expended more than NPS. When examining possible reasons for the variances in total costs between NPS and Point Mugu, China Lake, and Mare Island, many of the identified variance causes had no significant impact.

The first possible cause for the variances in total maintenance costs, which was considered, was the difference

in the number and size of units maintained by each installation. When comparing the number of units and the total dwelling square footage, it was determined that the difference in number of units and in total dwelling square footage spanned a range of ten percent or less. This narrow range should not make a significant difference in total maintenance costs because of economies of scale. Therefore, the difference in costs of maintenance which was funded and administered through these Housing Divisions and Departments should not be attributed to a variance in the number or size of dwellings.

Another factor which was considered that could have affected the total maintenance costs was a difference in local economies in which these installations operated. The differences in local economies were estimated by using the Department of Labor's Wage Determinations. Based on these wage determinations, Point Mugu should incur the least labor costs, followed closely by NPS, China Lake, and Mare Island. However, the overall variance in minimum labor rates is slight, see Table 4.6, and it should not significantly impact the total maintenance costs among these installations.

In looking for other possible causes of variances or differences in the total maintenance costs, the overall structural condition of the family housing units was examined. Based on the assessments of professionals in the housing and maintenance fields, overall condition ratings were used to grade the condition of the dwellings. Of the possible ratings of good, good-fair, fair, fair-poor, and poor, China Lake's rating was fair to fair-poor. NPS's rating was fair, and the collective condition of the units at both Point Mugu and Mare Island was good.

Based on these assessments and the expectation that units which are in better structural condition require less repair, it was expected that the total maintenance related

costs at Point Mugu and Mare Island would be less than the costs at NPS and China Lake. However, this was not the case. Figures in Table 4.1 indicate that even though the condition of dwellings at NPS are inferior to that of Point Mugu and Mare Island, the NPS Housing Division expended less than Point Mugu or Mare Island. Therefore, one might draw the conclusion that the NPS housing maintenance operations were more efficient.

While this study did not provide for a specific estimate of the dollar impact associated with a change in the condition rating of the dwellings, it did indicate, comparatively, which direction maintenance costs should gravitate as condition ratings change from poor to good.

The final difference examined among these installations which could have impacted the cost of up-keeping housing was the rate at which units were turned over. It would be reasonable to expect that a higher annual number of units being turned over would result in higher total maintenance costs.

Table 4.7 depicts the annual number of change of occupancies for the four installations. The Naval Postgraduate School reported approximately 410 change of occupancies per year. While Point Mugu, China Lake, and Mare Island reported approximately 350, 250, and 600, units, respectively, turned over annually.

Based on the change of occupancies and the number of units that each installation maintained, the average frequency which each unit was turned over was computed. The results of this computation, see Table 4.7 and Figure 4.3, indicate that for every change of occupant per unit at NPS, less than one change of occupant per unit occurred at Point Mugu; one-half a change of occupant per unit occurred at China Lake; and approximately one and one-quarter change of occupant per unit took place at Mare Island.

Based on the premise that the higher the frequency a unit is turned over the more maintenance costs are incurred, one would expect that more change of occupancy related costs should be incurred by Mare Island than at NPS. On the other hand, it would be expected that Point Mugu and China Lake would incur less change of occupancy related maintenance costs than NPS. While these conclusions did not allow for a precise adjustment to the total maintenance costs at these installations, it did provide a means to gauge, comparatively, what direction the overall maintenance costs of these installations should gravitate.

To reiterate, it appears that it is more cost beneficial for NPS to perform its housing maintenance requirements with in-house personnel. However, it must be noted that this conclusion was reached when considering the resources expended while maintaining 891 family housing units. This may not be the case when the number of units being maintained by the NPS Family Housing Division nearly triples.

Economies of scale between an operation maintaining 891 units and one maintaining nearly 2,600 units could be significantly different. While it may be cost beneficial to conduct housing maintenance for 891 units at NPS by employing on-station personnel, it does not automatically follow that it would also be cost beneficial to meet the maintenance requirements of nearly 2,600 units by the same method. In addition to the an increase in the number of units to be maintained, it should also be noted that instead of maintaining units that are at two sites which are within one and one-half miles of each other, the Family Housing Division will be maintaining units at four locations spread over approximately 15 miles.

C. RECOMMENDATIONS

1. NPS Specific Recommendations

As a result of this study, two recommendations for the NPS Family Housing Division are offered for action. The first recommendation, based on the conclusion that outsourcing at NPS does not appear to be cost beneficial, is that NPS continue to accomplish its military family housing maintenance by employing on-station personnel and augmenting this force through the use of outsourcing.

In an effort to improve efficiency and reduce costs, it is also recommended that NPS form a task group similar to the one described in Chapter III. The task group's primary mission would be to determine if the housing maintenance function is being performed in the most efficient manner by in-house personnel. A secondary, but equally important, mission would be to determine the impact of the nearly tripling of housing units on the Family Housing Division and its maintenance operations.

2. General Recommendations

Throughout the course of this study it seemed that, in practice, not all housing maintenance terms or processes were defined uniformly among installations (i.e., maintenance categories). Even though maintenance terms and processes are defined in regulations promulgated by the Navy, it is difficult to make comparisons among installations because of these inconsistencies. Therefore, it is recommended that the Naval Facilities Engineering Command emphasize compliance with the promulgated regulations.

The second recommendation is for the Naval Facilities Engineering Command to consider the need for a comprehensive year-end housing expenditure report (i.e., Housing Cost Report) from each installation. While NAVFACENGCMD closely monitors the Housing budgets and maintains close contact with the Housing Divisions and Departments, such a year-end

report may be useful at all echelons. It could provide the generating command a succinct record of costs with which to track expenditures over a period of years. At the same time, it could also prove helpful in establishing benchmarks for the operation and maintenance of military family housing Navy wide.

D. AREAS FOR FURTHER RESEARCH

The first area for possible further research is to determine if it is possible to quantify maintenance costs associated with a difference in the overall condition of a dwelling. What is the difference in maintenance costs of a unit that is determined to be in good condition versus one that is judged to be in fair condition? If this determination can be made, then the next logical research step would be to analyze the trade-offs of maintaining or improving housing units to a condition rating of good vice letting the condition of dwellings remain at some lower level and incurring higher maintenance costs.

The final area for possible further research that will be mentioned is to determine economies of scale for the operation and maintenance of various size military family housing organizations. What are the advantages or disadvantages of small, medium, and large family housing complexes?

LIST OF REFERENCES

1. Lemon, H. B., *The Development and Implementation of a Fair Market Rental System for Military Family Housing,* p. 11, Master's Thesis, Naval Postgraduate School Monterey, California, March 1977.

2. Congress of the United States, Congressional Budget Office, *Military Family Housing in the United States,* p. xi, Washington, DC, 1993.

3. Congress of the United States, Congressional Budget Office, *Military Family Housing in the United States,* p. 3, Washington, DC, 1993.

4. Congress of the United States, Congressional Budget Office, *Military Family Housing in the United States,* p. 34, Washington, DC, 1993.

5. U.S. Department of Defense, Department of the Navy, *FY 1994 Budget Estimates: Military Construction and Family Housing Program,* p. 310, Washington, DC, 1993.

6. U.S. Department of Defense, Department of the Navy, *FY 1994 Budget Estimates: Military Construction and Family Housing Program,* p. 310, Washington, DC, 1993.

7. U.S. Department of Defense, Department of the Navy, *FY 1994 Budget Estimates: Military Construction and Family Housing Program,* p. 310, Washington, DC, 1993.

8. U.S. Department of the Navy, Naval Facilities Engineering Command, *Navy Family Housing Manual,* p. ix, Alexandria, VA, 1989.

9. U.S. Department of the Navy, Naval Facilities Engineering Command, *Navy Family Housing Manual,* p. x, Alexandria, VA, 1989.

10. U.S. Department of the Navy, Naval Facilities Engineering Command, *Navy Family Housing Manual,* p. 9-28, Alexandria, VA, 1989.

11. U.S. Department of the Navy, Naval Facilities Engineering Command, *Navy Family Housing Manual,* p. 12-10, Alexandria, VA, 1989.

12. U.S. Department of the Navy, Naval Facilities Engineering Command, *Navy Family Housing Manual,* pp. 12-10-11, Alexandria, VA, 1989.

13. U.S. Department of the Navy, Naval Facilities Engineering Command, *Navy Family Housing Manual*, p. 17-6, Alexandria, VA, 1989.

14. U.S. Department of the Navy, Naval Facilities Engineering Command, *Navy Family Housing Manual*, p. 1-16, Alexandria, VA, 1989.

15. U.S. Department of the Navy, Naval Facilities Engineering Command, *Navy Family Housing Manual*, p. 1-16, Alexandria, VA, 1989.

16. U.S. Department of the Navy, Naval Facilities Engineering Command, *Navy Family Housing Manual*, p. 1-16, Alexandria, VA, 1989.

17. U.S. Department of the Navy, Naval Facilities Engineering Command, *Navy Family Housing Manual*, p. 1-16, Alexandria, VA, 1989.

18. Office of Management and Budget, Office of Federal Procurement Policy, *Enhancing Government Productivity Through Competition: A New Way of Doing Business Within the Government to Provide Quality Government at Least Cost*, p. 1, Washington, DC, 1988.

19. Office of Management and Budget, Office of Federal Procurement Policy, *Enhancing Government Productivity Through Competition: A New Way of Doing Business Within the Government to Provide Quality Government at Least Cost*, p. 2, Washington, DC, 1988.

20. U.S. Department of the Navy, Naval Facilities Engineering Command, *Navy Family Housing Manual*, p. 12-10, Alexandria, VA, 1989.

21. Roesling Nakamura Architects Inc., *Comprehensive Neighborhood Plan: Existing Conditions / Concepts, NAWS Point Mugu and Catalina Heights* (Draft), p. 1-1, San Diego, CA, 1994.

22. Interview between Mike Fagan, Deputy Housing Director, Naval Shipyard, Mare Island, CA, and author, 30 September 1994.

INITIAL DISTRIBUTION LIST

1. Defense Technical Information Center 2
   Cameron Station
   Alexandria, VA 22304-6145

2. Library, Code 52 2
   Naval Postgraduate School
   Monterey, CA 93943-5101

3. Family Housing Division, Code 43H 1
   Naval Postgraduate School
   Monterey, CA 93943-5002

4. Director, Training and Education 1
   MCCDC, Code C46
   1019 Elliot Rd.
   Quantico, VA 22134-5027